THE AEROPLANE

Incorporating
Aeronautical Engineering
Edited by - - THURSTAN JAMES

Founder and First Editor
(1911-1939), C. G. GREY

Proprietors:
TEMPLE PRESS LIMITED
Chairman and
Managing Director:
ROLAND E. DANGERFIELD

Head Office:
BOWLING GREEN LANE,
LONDON, E.C.1.
Telephone: Terminus 3636
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"Pressimus London Telex"
Telex: 23839

Vol. XCIV. No. 2431 APRIL 4, 1958

Annual Subscription Rate: U.K. £4.15.0.
Overseas £5. Canada and U.S.A. $15.00

CHEAPNESS VERSUS COMFORT

OVER 200 people, mostly members of the Royal Aeronautical Society, gathered to hear Mr. Beverley Shenstone, chief engineer of B.E.A., deliver the 13th R.Ae.S. Commonwealth Lecture. In view of the extremely limited advance publicity, it makes one wonder how many people would have attended had there been any kind of " build-up." Mr. Shenstone has achieved a reputation not only for saying what he thinks, but also for thinking before he says it. His views, therefore, command widespread attention if not agreement.

In spite of the conversational style of his delivery, the lecturer was at pains to be precise not only in setting out the requirements of the airlines, but also the reasons why airline operators are hard to please. We outlined last week some of the high points of the lecture.

In his conclusion, as we reported last week, the lecturer notes " that the public makes life difficult for the airlines, but since they exist for the public, and not for their own amusement, the airlines must press forward in an attempt to keep the public more or less happy, but this is harder and harder to do, and the public is likely to become harder to please, which in turn makes the airlines harder to please."

Unfortunately, the custom of the Royal Aeronautical Society precludes discussion at the conclusion of any of their special lectures such as the annual Wilbur Wright occasion or the Commonwealth lecture. This did not deter Sir George Edwards, with the complete neutrality that befits his office as president of the Society, from imagining what some manufacturer might have said, had it been possible for him to express his views.

It is not for us to presume to express the views of other members of the industry who perforce have to restrain expression of their opinions. It seems reasonable, however, for us to express our views as customers of the airlines. We may be a rather specialist, and certainly a microscopically small, section of the public, but we do not believe that we, as members of the public, nor those other travellers to whom we speak, are so fantastically hard to please.

We suspect that the preference of the public for travelling in the fastest available aeroplane is not a question of having high standards but simply a result of the natural human desire to get to the end of the journey. After all one travels to arrive; any other form of travelling then becomes touring or in steamship parlance " cruising."

It may well be that the time is ripe, or nearly ripe, for the aerial counterpart of the steamship cruise to the colourful places of the world. No doubt if the time has come, it will not take long for our fiercely independent aircraft operators to make the most of the opportunity. Who knows? Such a new form of air travel might play the Prince Charming to kiss the sleeping Princess flying-boats awake!

However, let us get back to what Mr. Shenstone calls " the most modern comfort." He defines this as meaning narrow seats pitched 34 in. to 36 in. apart. He goes on to say " people object to narrow seats three-abreast, and they will certainly object more often to future closer spacing." And as they are going to sit closer, it scarcely sounds like the dictatorship of the fare-paying public.

Frankly, it may be true that the public is hard to please; we are all, if our standards are worth anything at all, hard to please; but *pace* the chief engineer of B.E.A., airlines do not have to please the public, they have to persuade them that it is more advantageous to go by air. In almost every instance one can think of, the advantage of travel by air, as opposed to other methods, is that it gets the traveller there more quickly. And the less the differential charged for getting there more quickly, the more people will travel by air.

Apart from the indubitable cleanliness of air travel, most air travellers flying " tourist " will complain about the inadequacy of seating arrangements and toilet arrangements. They will grumble too about the quality of food and the lack of sleeping facilities. Nevertheless, they will put up with lack of seating comfort, poverty of feeding arrangements and lack of sleep if the airline will get them there more quickly.

A most interesting experiment is going to be made by Airwork which concern for years has been the proponent of the " stopping " air service. In brief, a through service is to be introduced over the African route so that comparison may be made with the present comfortable Safari service, which provides a night stop on the trip between Kenya and the U.K. and flying straight through. Our bet is that, for equal fares, the through service will prove the more popular.

As a final word from members of that public which is hard to please, though prepared to travel rough if it travels cheap, may we ask the chief engineers of airlines for footstools that would be a boon to short-legged passengers, for hooks on the sides of fuselages for jackets that have to come off in hot climates and finally for means of fastening trays to chairs so that harassed mothers with three children are not expected to balance four trays on one maternal lap.

MATTERS OF MOMENT

Canada's New All-weather Fighter

ON March 25, with no prior publicity or fanfares of trumpets Avro Aircraft's CF-105 Arrow supersonic delta-wing all-weather fighter was taken into the air for the first time—at Malton airport, Toronto. It was flown by the company's chief test pilot, Jan Zurakowski, and was airborne for 37 minutes, "paced" by a CF-100 and a Sabre. Although this noteworthy Canadian maiden flight had gone unheralded, just prior to take-off the entire Avro factory at Malton was alerted and the Arrow's first take-off and landing had an audience 10,000 strong.

According to first reports from Canada the flight was confined to general preliminary handling and a check of the instrumentation. The Arrow was not taken above 10,000 ft. but when he landed Zurakowski expressed his satisfaction with the new aircraft's behaviour.

Powered initially by two Pratt & Whitney J75 turbojets, the Arrow is a two-seater designed specifically for the R.C.A.F. to meet Canada's special requirements in relation to all-weather fighter defence. Production versions of the aircraft will have Orenda Engines' Iroquois turbojets—the thrust of which has been quoted as 28,000 lb. with afterburning.

No official figures have been given for the Arrow's weight and performance, but it is believed to weigh in the region of 60,000 lb. and to be in the Mach 2 category with ceiling of around 63,000 ft. One of its outstanding features is a remarkable aerodynamic cleanliness—although at first sight its near-rectangular fuselage cross-section takes a little getting used to. The wing, which is only about 4% thick, is swept back at 60° on the leading edge; this has the usual saw-tooth form and in addition is given a comparatively deep "cut." Some of these details can be seen in photographs on page 483 of this issue.

As one would expect with such an advanced aircraft, full use has been made of the latest skin-milling techniques in its structure and titanium has been extensively employed. Martin-Baker Mk. 5 ejection seats are provided for the two occupants. The Arrow's offensive armament comprises a "cluster" of Sparrow 2 air-to-air guided missiles carried in a ventral weapons bay, but an alternative "military load" in the form of a small nuclear bomb has also been mentioned.

The Swiss Sapphires

REPORTS that the second prototype of the Swiss P.16 ground-attack fighter has crashed have led to suggestions that a contract for the manufacture in Switzerland of the Armstrong Siddeley Sapphire turbojet, which powers the type, will be cancelled.

The fact is that the contract has been signed, as we reported in our issue of March 14, and although the Swiss Federal Military Department has suspended the order for 100 P.16s pending an enquiry, the only effect so far as the Sapphire is concerned is that manufacture in Switzerland will be temporarily delayed. Initial suggestions are that the cause of the accident in no way concerned the engine.

The P.16 crashed into Lake Constance on March 25; the pilot was saved. The first prototype was lost in a similar way. Three aircraft have so far been built.

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SIGNED AND SEALED.—Mr. A. F. Burke, managing director of The de Havilland Aircraft Company, watches Lord Douglas of Kirtleside, B.E.A. chairman, sign the contract for Comet 4Bs. The contract, valued at about £7 million, is for six aircraft and spares. Delivery is to begin early in 1960.

Britannia for the Princess

THE NEWS that H.R.H. Princess Margaret is to travel to Port of Spain, Trinidad, in a Bristol Britannia on April 20, to inaugurate the West Indies Federal Assembly two days later, has evoked lively satisfaction throughout the Caribbean.

The Britannia, equipped as a V.I.P. aircraft, will be seen at several of the Caribbean islands. Meanwhile a Vickers Viscount of B.W.I.A. is being equipped in V.I.P. style to carry Her Royal Highness from Kingston to Belize, British Honduras.

DC-3s are at present used on the Kingston-Belize route, but will be replaced by Viscounts when the runway at Kingston has been resurfaced.

Antipodean Attitude

IN an action which, if not unique, certainly has few precedents, the Australian Government has laid down re-equipment policy for two domestic airlines. Permission has been refused for Ansett-A.N.A. to buy four Lockheed Electras and for the Government-owned T.A.A. to buy two Sud-Aviation Caravelles. Instead, these two operators have been told that the Vickers Viscount 810 is more suited to Australian requirements.

The decision, taken by the Cabinet, was announced by Senator Shane Paltridge, Minister of Civil Aviation, who recently visited American, British and European manufacturers in the course of a round-the-World tour. It was made, according to the Senator, after a detailed financial and technical survey, and it seems that a number of factors have combined to influence the Government view. The Australian air transport industry has been passing through a grave economic crisis, according to the Government, and its rate of profit is still marginal. The rate of traffic growth is slow and a period of stability is now urgently needed, in which the airlines can consolidate. Against this background, the Government believed that it would be wrong for Ansett-A.N.A. and T.A.A. to pioneer Electra and Caravelle operations, and that the purchase of these types would stimulate a competitive race for other new turbine types which could be disastrous to economic stability.

Senator Paltridge is also reported to have said that the Electra and Caravelle cannot operate economically on stages of less than 500 miles, which carry 75% of traffic in Australia.

Their introduction would add substantially to total costs of national transport.

T.A.A. already have purchased 13 Viscounts of the 700 Series, and are modifying the first 11 of these for increased gross weight (see THE AEROPLANE, January 31, p. 134). Ansett-A.N.A. were reported several weeks ago to be planning to purchase four Viscount 810s, and this order will be confirmed shortly. It is not clear, however, whether these aircraft were wanted in addition to the four Electras, or whether Ansett was astute enough to foresee the Government decision.

Representatives of the British manufacturers have recently been in Australia to take part in discussions with the Government and operators, including a Vickers team led by Sir George Edwards and Mr. Derek Lambert; and the managing director of de Havillands, Mr. A. F. Burke.

More Exports—Bigger Farnborough

A STATEMENT made recently by the director of the Society of British Aircraft Constructors, Mr. E. C. Bowyer, reveals that exports by the industry in January and February were higher than ever before, and there is a coincidental increase in applications for stands at the next display. Consequently a bigger and better Farnborough may be expected.

The export figures for the first two months of this year show an increase of 45% over last year's, and represent an annual rate of £145 million. The 1957 figure—itself a record—was £116.5 million.

In February exports totalled £12,978,483—the third largest monthly figure ever achieved—and brought the sum for 1958 so far to £24,157,745, compared with £16,742,595 for the corresponding period in 1957.

Aircraft and parts last month accounted for £8,780,719 of the total; engines, £3,694,019; electrical parts, £290,045; tyres, £43,472 and aeronautical instruments, £170,228. India bought more from us than any other customer (£1,979,625-worth of aircraft and parts); Canada was next with £1,633,713; then U.S.A. with £1,009,515, the Netherlands (£571,804) and Eire (£355,424).

Of the January-February total £15,603,708 was accounted for by aircraft and parts; engines, £7,632,917; electrical parts, £533,586; tyres, £89,811; and aeronautical instruments, £297,723. During this period India bought £3,547,867-worth of aircraft and parts; Canada, £2,097,080; the U.S.A., £1,267,905, and Iraq, £1,265,485.

Of this total more than £3,360,000, or 22%, was paid in dollars.

British Commonwealth Lecture

A HIGH-LEVEL audience heard Mr. B. S. Shenstone, chief engineer of B.E.A., deliver the Royal Aeronautical Society's thirteenth British Commonwealth Lecture on March 27. He discussed "Why Airlines are Hard to Please"; points from his lecture appeared in THE AEROPLANE last week.

Following Mr. Shenstone's talk, which pulled no punches in putting the airlines' viewpoint, a vote of thanks was proposed by MR. S. SCOTT-HALL, scientific adviser to the Air Ministry, and seconded by MR. A. D. BAXTER, chief executive of the Rocket Engine Divn. of the de Havilland Engine Co., Ltd.

SIR GEORGE EDWARDS, president of the R.Ae.S., said that by tradition there was no discussion after the lecture; however, "had there been a discussion" an aircraft manufacturer might have made several points. These were that an airline, by virtue of its position as a customer, usually got the product it wanted. If an airline made a mistake and decided to go elsewhere after receiving only a small batch of new aircraft, this decision had a much greater impact on the manufacturer than on the airline, which could absorb its losses much more easily. It was a pity that someone "did not get the opportunity to say these things," said Sir George.

After the lecture a dinner was held at the R.Ae.S. building in Hamilton Place. The Hon. George Ward, the Secretary of State for Air, was a guest.

Inspection Tasks and Problems

A THOROUGH survey of the work of the Aeronautical Inspection Directorate was presented in a lecture to the Society of Licensed Aircraft Engineers on March 14 by Mr. R. E. Swift, Director of Aeronautical Inspection at the Ministry of Supply. He spoke of the basic problems of inspection and outlined the organization of the A.I.D. He then surveyed in detail the problems of aircraft and engine inspection and went on to speak of the importance of material control.

In the discussion which followed his lecture, Mr. Swift answered a series of searching questions about the work of the A.I.D. He said its technical staff totalled about 1,000 and that it ran an apprenticeship scheme for some 50 trainees which was comparable with industrial schemes. Courses were run to keep A.I.D. personnel in touch with the latest developments.

Asked about the differences between the inspection systems of the A.I.D. and the Air Registration Board, he said that both had the same objective but that the approach differed. One questioner felt that visits were excessive; Mr. Swift said the A.I.D. would not come at all if there were no problems.

Asked about aircraft repair schemes which were done by the

SHOOTING OFF.—Avro Aircraft's Arrow making its first flight on March 25; the air brakes have been lowered immediately after take-off, presumably to prevent speed building up to the maximum wheels-down value too quickly.

STOLSKI AND VTOLSKI.—Photographs of these two new Russian aircraft have recently been "released" in Moscow. Right, with a counter-rotating co-axial rotor, this helicopter is said to be a general-purpose type with a top speed of 80 m.p.h. Below, this light general-purpose high-wing monoplane is a later version of the Antonov An-14; it originally had much larger vertical tail surfaces.

R.A.F., Mr. Swift agreed that in general the responsibility for inspection lay with the engineer officer in charge. Questioned on statistical quality control, he said that this technique implied a certain defect rate; for some vital applications no risks could be taken.

Mr. R. E. Hardingham, chief executive of the A.R.B., spoke of fatigue problems and said that experience showed fretting effects to be worse than those of corrosion. A.I.D. members present said that fretting problems were a matter of design.

Cranfield and the Future

TOPIC of the moment at Cranfield, as guests invited to the Tenth Annual Dinner of the Senior Common Room on March 28 soon found out, is to what extent the College of Aeronautics should widen its curriculum. For some time, as is generally known, the Works Study Department of the College has been covering many fields of manufacture other than aeronautical.

Sir Roy Fedden, to whom tribute was paid by speakers as the founder of the College, though a guest, did not speak. His views on the importance of planned aeronautical activity in this country have been forcibly expressed frequently. What would have been particularly germane to the present discussion on the future of the College are his views about the importance of aeronautical engineering to all forms of engineering in the United Kingdom.

Toast of the "Senior Common Room" was proposed by SIR SOLLY ZUCKERMAN, Professor of Anatomy at Birmingham University, who is deputy chairman of the Advisory Council on Scientific Policy and chairman Natural Resources (Technical) Committee. After discussing the broad implications of our present educational policy, he spoke of the importance of developing the international aspect of the College's work and with the aid of international money if need be.

MR. A. F. NEWELL, who replied in a series of sparkling sallies, by tradition spoke of the staff who were leaving the College for other fields of activity.

PROF. J. A. J. BENNETT, head of the aerodynamics department, enlarged on the merits of the guests. SIR GEORGE EDWARDS, president of the Royal Aeronautical Society, spoke of the need for a course in salesmanship, particularly directed to the selling of aeroplanes. This was something that we in this country did not even know how to start (which from the head of the organization which has sold hundreds of Viscounts might be regarded as a considerable understatement).

Beverley Statistics

IN a lecture on the Service life of the Blackburn Beverley which was to be given at Brough on April 2, by Gp. Capt. F. C. Griffiths, D.F.C., A.F.C., Officer Commanding R.A.F. Abingdon, a number of interesting statistics were disclosed.

In the first year of freight operation from Abingdon 10,500,000 lb. of freight and 2,763 passengers were carried. This period also included a lot of work in the transport support rôle with the Army and crew-training flights, so that not many Beverleys were available for straight freight duties. On the scheduled service to Wildenrath, 2nd T.A.F., the normal load is 32,000 lb. and on some occasions two trips have been completed on the same day with one aircraft.

During the Suez operation Beverleys were not engaged in the assault rôle, but carried troops and materials from the U.K. to Cyprus and one aircraft in particular was flying between Cyprus and Gamil airport at Port Said. This aircraft carried fuel in barrels for the Army, amounting to 609,000 lb. in 21 sorties. The aircraft had to carry enough fuel itself to return to Cyprus.

The longest flight so far made by an R.A.F. Beverley was from Aden to El Adem in 14 hr. 14 min. This flight was made at an I.A.S. of 123 knots and the freight load was 2,000 lb. In the transport support training rôle over 5,500 parachute troops were dropped from Beverleys in the last six months of 1957.

SCOTTISH PARTY.—On March 27, a Scottish Aviation Twin Pioneer was handed over to the High Commissioner for Malaya at Prestwick. Here the Duke of Hamilton (second from left) is with His Excellency Prince Ya'acob ibni Al-Marhum Sultan Abdul Hamid Halim Shah; with them are members of the crew who will fly the aircraft to Malaya.

News of Aircraft, Engines and Missiles

CONWAYS FOR DOUGLAS.—The first Rolls-Royce Conway for the DC-8 will be delivered to Long Beach in August according to Mr. J. D. Pearson. He said that the 17,250-lb. s.t. Conway now has over 1,000 hours' flight time and thousands of hours of running on test stands.

TRANSITION POINT.—In the last two months the Fairey Rotodyne (two Napier Eland turboprops) has averaged one flight a day. Progress has been excellent and we expect to learn that transition has been achieved at any time now.

AMERICA'S THIRD. — Another Explorer Earth satellite was fired successfully from Cape Canaveral on March 26. It has deviated a little from the planned orbit, however — having a 2,000-mile apogee and a 100-mile perigee—and is not expected to stay in orbit long.

ZEPPELIN BABY. — Metallwerk (formerly the Zeppelin company), of Friedrichshafen, is building a non-rigid airship some 175 ft. in length and 43 ft. in diameter. The volume is around 150,000 cu. ft. It may be launched in May.

U.S. MOON ROCKETS.—The U.S. will make up to five attempts to hit the Moon with unmanned rockets. These "lunar probes" have been approved by Pres. Eisenhower. Launching preparations have been in progress for some time. The rockets will "determine U.S. capability of exploring space in the vicinity of the Moon and obtain useful data concerning the Moon."

U.S. BACKLOG.—Some percentages quoted in a news item last week concerning the military share of outstanding aircraft, engine and propeller orders in the U.S., were given in a way that might have led to misunderstanding. The backlog on September 30, 1957, was £5,160 million. The figures failed to make plain that in this total 70% of aircraft orders, 79% of aero-engine orders and 80% of propeller orders were for the U.S. forces.

U.K. MISSILE NEWS.—Mr. Aubrey Jones, Minister of Supply, confirmed in Manchester last week that Bristol Bloodhound surface-to-air missiles were to go into service with the R.A.F. in the autumn. Bloodhound has still to complete its acceptance trials at Woomera. Mr. Jones visited the Ferranti Guided Weapons Establishment, which makes the control systems, at Wythenshawe on March 28.

NEW AT NEWBURY.—The Olympia 419 high-performance single-seat sailplane flew for the first time last week-end at Thruxton, piloted by Mr. David Ince. This aircraft has been specially designed by Elliotts of Newbury, Ltd., for the World Gliding Championships to be held in Poland in June.

FRENCH TURBOPROP.—Latest from the prolific Turboméca factory is the Bastan, a turboprop engine of 750 s.h.p., two of which will power the Max Holste Super Broussard.

RUSSIAN RECORD.—The Soviet Union has submitted to the F.A.I. a claim for a class record over a 100-km. closed circuit by an Mi-1 helicopter. Flown by Aziz Avidzba, this took off from Tushino, near Moscow, on March 5, and completed the triangular course at an average speed of 176.652 km.p.h. (about 109.75 m.p.h.).

U.S. ROCKET NEWS. — Two American Nike - Cajun meteorological rockets were fired in Manitoba recently. Two photographs per second were taken by cameras installed in the separated nose cones during their parachute descent from 80 miles' altitude.

NO CAMERAS. — Changing operational requirements have removed the need for a photo-reconnaissance version of the Convair B-58 Hustler, and the camera-pod contract held by Fairchild has been cancelled.

MISSILE CONTRACT.—The Martin Co. has been awarded a contract for the development of the weapons system for the U.S. Army's new solid-propellent Pershing missile, successor to the Redstone ICBM.

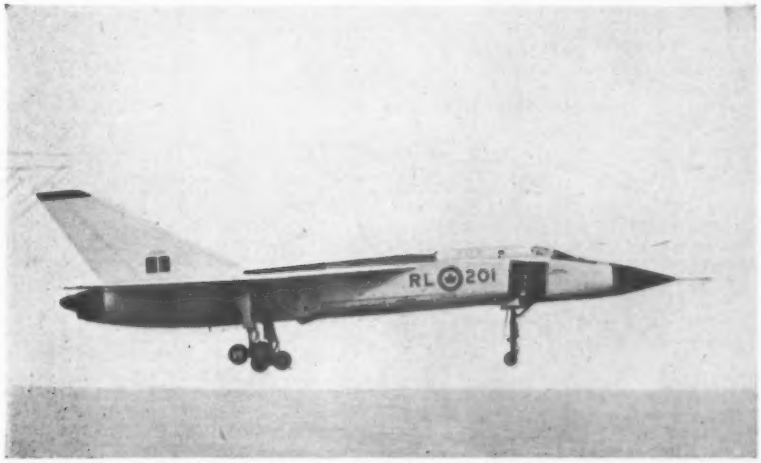
IL-18 ACCEPTED.—Moscow Radio reports that acceptance flights of the Ilyushin Il-18 Moscow turboprop airliner have been successfully completed.

RUSSIAN PRECISION.—According to reports, a meteorological sounding rocket has been fired in Russia to a height of 293.7 miles and returned to Earth at the precise predetermined spot. It is said to have weighed 1½ tons.

SIDEWINDER PRODUCTION. — Contracts totalling $25 million for the production of the Sidewinder air-to-air missile for the U.S. Army and Navy have been given to the Philco Corpn. and the General Electric Co.

FIELD ARTILLERY. — The Martin Lacrosse, close-battle support missile with a range of 20 miles, has been ordered into production by the U.S. Army with a $16 million contract.

HUGHES ORDER.—First five of the Hughes YHO-2 helicopters for the U.S. Army are now being built. Formerly known only as the Model 269, the two-seat YHO-2 weighs 890 lb. empty and carries a useful load of 660 lb.



ARROW ALOFT.—Another picture of the Avro Aircraft Arrow in the air near Malton, Ontario

Commercial Aviation Affairs

B.E.A. PROFIT.—Lord Douglas has said that he believes that B.E.A. will achieve its largest-ever profit in the financial year ending March 31. He says, however, that losses this winter continue to be abnormally high.

NORTHEAST BRITANNIAS.—In his annual report to the shareholders, the president of Northeast Airlines says that Bristol have until May 1 to obtain an American certificate for the Britannia 305, and that Northeast has 60 days from certification date in which to arrange the necessary financing and secure the consent of its lending banks to the purchase. Northeast is also evaluating additional jet equipment and has a definite need for a more economical short-haul aeroplane than that currently in service.

VISCOUNT FOR AVIATECA.—Guatemala's national airline, Aviateca, hopes to place Viscounts in service later this year, according to Col. Oscar Morales Lopez, newly designated president of the company. He said that Aviateca plans to lease one or more Viscounts from the Nicaraguan operator LANICA (which has two) and will use them on international service to the U.S.A.

B.E.A. TO WARSAW.—On Tuesday of next week, April 8, B.E.A. will start services on the London-Warsaw run. Viscount 701s will be used and the frequency will be twice weekly. The Polish airline, L.O.T., will use Convair 340s on reciprocal services on and after that date.

FRIENDSHIP FIRST.—The first production Fokker Friendship, which we illustrated last week, made its first flight on March 23, eight days ahead of schedule. Delivery to Aer Lingus is scheduled for October.

ELECTRA SCHEDULE.—Target date for C.A.A. certification of the Electra has been moved forward from September 30 to August 22, as a result of rapid progress made so far. Up to March 18, the first Electra flew 106 hours in 75 flights and the second flew 39 hours in 24 flights. Third aircraft is to fly on April 10 and fourth in May. Deliveries to airlines in 1958 will total 12 to Eastern (starting in September) and two to American (in December).

QUIETER Tu-104.—A Russian civil aviation delegation visited London between March 24 and March 29, to continue negotiations for the introduction of a joint London-Moscow service (see pages 470-473 of this issue). It is reported that the delegates have undertaken to investigate means of silencing the Tu-104.

DORVAL'S NEW TERMINAL.—A new air terminal at Dorval Airport, Montreal, will feature "island" gate positions, connected by subways to the main terminal building. Each island site will be able to handle traffic to and from four aircraft simultaneously. The plan in general resembles that adopted for the new Los Angeles terminal area.

BORNEO CHANGES.—At its first meeting in Sarawak, the newly formed Borneo Airways decided to take over the assets of Sabah Airways and of the Malayan Airways feeder services in Borneo. Of the six directors of the company, three are appointed by the government of Sarawak, North Borneo and Brunei, and three by B.O.A.C. The initial fleet will consist of three D.H. Rapides and two Twin Pioneers.

G.E.C. CONTRACT.—The General Electric Co., Ltd., has been awarded a contract by the Government of Hong Kong for the supply and installation of the complete operational lighting system at the new Kai Tak Airport (see photograph in THE AEROPLANE for March 21). The contract covers supply and installation of high and low intensity runway and approach lighting, taxi-way lighting, a location beacon, obstruction lighting, navigational warning lights and auxiliary terminal apron lighting.

NEW OPERATOR.—A non-scheduled airline recently formed in Germany with the name Aerotour is expected to use DC-4s for its operations. President of the company is Mr. M. F. Ferreira, who is co-owner of the Eastern Aircraft Corp. in America, which recently purchased six DC-4s from T.W.A. The aircraft are being overhauled at Burbank by Pacific Airmotive Corp.

T.W.A. MODERNIZATION.—Trans World Airlines are modernizing their fleet of L-049 Constellations with the installation of a new propeller-control assembly system to give reverse thrust. The modification involves the use of an integral fluid system which does not depend on oil from the powerplant.

UNITED ARAB AIRLINES.—Following the formation by Syria and Egypt of a United Arab Republic, Syrian Airways and Misrair are expected to merge into a single company. An offer from Aeroflot to purchase a one-third interest in the new joint company is reported, however, to have been rejected.

FARTHEST NORTH.—A new civil airport is being built at Aklavik, North-West Territory, and this will be the most northerly one to be established on the North American continent. At present the airport at Frobisher, Baffin Island, is the most northerly of Canada's airports.

CANADIAN REORGANIZATION.—The structure of the Civil Aviation Branch of the Canadian Department of Transport's Air Services is being re-organized under Mr. J. R. K. Main, its recently appointed D.C.A. Separate organizations will deal with accident investigation; air operations and regulations; and airports.

A.R.B. NOTICES.—The Council of the Air Registration Board announces the issue of the following Notices to Licensed Aircraft Engineers and to Owners of Civil Aircraft: No. 2 Issue 13; No. 51 Issue 1. Both are dated March 18, 1958.

News About People

ROYAL INTEREST.—During the recent State Visit to the Netherlands, H.R.H. The Duke of Edinburgh visited the Utrecht Trade Fair where he inspected the N.H.I. Kolibrie with Prince Bernhard (right).

JOINT COUNCIL APPOINTMENT.—Mr. Eric Rylands, managing director of Skyways, has been elected chairman of the National Joint Council for Civil Air Transport. He succeeds Mr. Ian Mikardo, M.P., and is the first representative of the independent operators to hold this office.

MINISTRY APPOINTMENT.—Mr. W. E. B. Griffiths, O.B.E., F.I.M., has been appointed director of civil aviation safety and licensing at the M.T.C.A. He succeeds Mr. J. B. Veal, whose appointment as deputy director general of navigational services we noted last week.

N.P.L. CHANGES.—Three new Divisions have been set up at the National Physical Laboratory. These are the Standards, Applied Physics, and Basic Physics Divisions and will replace the three Divisions previously known as Electricity, Metrology, and Physics, and the Test House. The new post of deputy director of the National Physical Laboratory has been given to Dr. Edward Lee, at present D.O.R. in the R.N. Scientific Service.

SPERRY CONTRACTS.—The new contracts manager of the Bracknell division of the Sperry Gyroscope Co., Ltd., is Mr. N. L. Lupton, M.A., A.F.R.Ae.S.

GRAVINER DIRECTOR.—Mr. Donald L. Forbes, F.C.A., J.P., of Forbes and Co., chartered accountants of Forest Gate, London, E.7, has been appointed a director of the Graviner Manufacturing Co., Ltd., with which he has been associated since 1936.

PILCHER GLIDER.—On March 26 Mr. E. T. Jones, Director General of Technical Development at the M.o.S., and a former R.Ae.S. president, presented

to Lord Braye a replica of Percy Pilcher's glider for the Stanford Hall Museum at Rugby. The glider, a picture of which we published on March 14, was built by apprentices of Armstrong Whitworth Aircraft, Ltd. It will form the main attraction of the aviation exhibits of the museum, which is to be open to the public for the first time on Easter Sunday, April 6.

AWARD WINNERS.—Mr. G. G. Roberts, technical director of Smiths Aircraft Instruments, Ltd., and Mr. J. E. N. Hooper of the Royal Radar Establishment, Farnborough, have been awarded the Musick Memorial Trophy for their work on cloud and collision warning radar. This international award is made annually by the Royal N.Z.Ae.C. to the group, body or individual who makes the most practical contribution, development or improvement to the safety of aircraft with special regard to trans-oceanic aviation.

WAYFARER. — Maj. F. G. Fox has recently returned from a 12 months' tour of Africa made in a D.H. Rapide. He is a member of the Fair Oaks Aero Club.

PUBLICITY MANAGER. — Armstrong Whitworth Aircraft inform us that their chief of publicity, Mr. L. W. R. Robertson, M.I.Mech.E., is retiring because of ill-health. The company also states that Mr. J. K. Corfield has been appointed publicity manager and will be responsible for publicity for the AW.650.

SOUTHERN POST.—Mr. Phillip Sellars has joined the board of Southern Instruments, Ltd., as vice-chairman. He will be responsible for the overall co-ordination of the company's activities.

DESIGNER DIES.—Roger Druine, the French designer of several successful ultra-light aircraft, died on March 19, at the early age of 37. He was an enterprising constructor and produced his first aircraft, a light biplane, when he was 16. His best-known designs are the Turbulent and the Turbi, and the last aircraft for which he was responsible was the Condor.

PACIFIC PIONEER.—We regret to record that Mr. Clyde Pangborn died in New York on March 29, aged 63. He made the first non-stop flight across the north Pacific from Tokyo to Wenatchee, Washington, in 1931, and is perhaps best remembered for his part in the MacRobertson air race of 1934 when, flying as co-pilot to Col. Roscoe Turner in the Boeing 247D, he arrived third at Melbourne. In brief biographical notes published in connection with that race we wrote that he was "one of America's best; cool, quiet and gets there."

TEST PILOT. — Mr. Philip Murphy has joined Handley Page, Ltd., as an experimental test pilot.

WG. CDR. A. H. MEASURES.—After a lifetime in aviation (beginning at the Royal Aircraft Factory in 1911) Wg. Cdr. A. H. "Pop" Measures has retired from B.E.A. at the age of 76. He served with the R.F.C. and R.A.F. from 1914 to 1930 and then served with Imperial Airways and Railway Air Services. In 1946 he became one of the original members of the B.E.A. board, and after his five-year term in this capacity he became chairman of the Corporation's Air Safety Committee.

Military Aviation Affairs

UNOFFICIAL RECORD.—One of the three Bomber Command Avro Vulcans which took part in the official opening ceremonies of Embakasi Airport, Nairobi, last month (THE AEROPLANE, March 14) has set up an unofficial record between Nairobi and Salisbury. With A. V. M. Walker, A.O.C., No. 1 Group, on board, the Vulcan covered the 1,215 miles at an average speed of 593 m.p.h. and did the return trip at an average of 608 m.p.h.

R.A.F. COMET OPERATIONS.—The 10 Comet 2s of No. 216 Squadron, R.A.F., have now flown more than 10,000 hours since they entered service and covered a distance of some 5 million miles. R.A.F. Comet flights in the past nine months have included 85 return trips to the Far East, 60 transatlantic crossings and 30 crossings of the Pacific; these include a 2,500-mile ocean stage between San Francisco and Honolulu. The 19,000-mile round journey from the U.K. to Christmas Island and back is scheduled to take 3¼ days.

FIGHTER RECONNAISSANCE.—A Supermarine Scimitar F. Mk.1 fitted with a self-contained camera nose for fighter reconnaissance work. The extra length of this version can be compared with the standard fighter configuration behind it. An article on the Service trials of the Scimitar appears on pages 478-9 of this issue.

U.S.A.F.E. MOVE.—Three U.S.A.F.E. all-weather fighter squadrons in the United Kingdom equipped with F-86D Sabres are being transferred to the Continent. The 512th Squadron at Bentwaters was being moved to Sembach, West Germany last month; the 513th Squadron at Manston is being transferred to Phalsbourgh, Alsace, this month, and the 514th Squadron, also at Manston, is moving to Landstuhl, Bavaria, by the end of May.

HELICOPTERS FOR AUSTRIA.—The first three of six Alouette helicopters ordered by the Austrian Air Force from Sud-Aviation have now been delivered to Vienna; pilots are being trained there by Col. G. Hauck, the air force's chief helicopter instructor. Three Westland S-55 Whirlwinds are due to be delivered during this month.

GERMAN SYCAMORES. — Two Bristol Sycamores, fitted as V.I.P. transports, and finished in a special blue and white livery, were flown out to the Luftwaffe recently. These are the 21st and 22nd machines to be delivered since the original order for 50 was placed in March, 1957.

SWEDISH VERTOLS.—Two Vertol H-21 helicopters have been delivered to the Swedish Navy, after assembly in Germany, and will be followed by another two this month. The number should be increased to six by 1959, when the navy's first helicopter squadron will also have two Sikorsky S-55s and four smaller types. Four more helicopter squadrons will eventually be formed for anti-submarine, reconnaissance and communications duties.

LOCKHEED ORDER.—Ten Lockheed P2V-7 Neptune patrol bombers worth $9 million have been ordered by the U.S. Navy for the French Navy under the military assistance programme. Neptune production began in 1944 and this is the 26th contract for the type.

R.Ne.A.F. ANNIVERSARY.—Thirteen NATO air forces are expected to take part in an air display at Soesterberg Air Base, Holland, on July 5 to mark the 45th Anniversary of the Royal Netherlands Air Force.

SEEING THE "VICTORIOUS."—During the Easter Navy Days at Portsmouth on April 5, 6 and 7, the carrier "Victorious" is to be open to the public for the first time since its commissioning in January.

CATAPULT TRIALS. — Deadload trials to check the operation of the steam catapults of the carrier "Victorious" have been made at Portsmouth. Using wheeled launching tanks, the catapults were tested at various simulated aircraft weights and launching speeds.

NATO AIR DISPLAY.—Within the framework of the Brussels World Fair the Belgian Air Force is organizing a NATO Air Display at Bierset Airfield, Liège, on June 29. A static exhibition is to be held on the airfield from June 27 to 29.

COMET CORROSION.—Minor external corrosion has occurred on the painted undersides of Comet 2s operated by R.A.F. Transport Command. Repairs to the aircraft affected are being done in rotation by de Havilland at Hatfield.

MISSILE QUOTE. — Major-General Schriever, head of the U.S.A.F. missile development programme, has said that he does not believe that Russian ICBM's are operational yet.

AIR TRANSPORT

B.E.A.'s 1958 Look

BRITISH EUROPEAN AIRWAYS' plans for the coming summer season will give a new look to its operations in Europe. They include the almost complete elimination of piston-engined aircraft from international routes and the introduction of mixed tourist and first-class services. B.E.A. also expect to open the London-Moscow route and will embark on a programme of Rolls-Royce Tyne development flying.

By retiring the remainder of the Elizabethan fleet, B.E.A. will by mid-summer be operating Viscounts throughout their international network, with the exception of local operations from Gibraltar and the London-Salzburg route where runway restrictions still make it necessary to use Pionairs. This extended use of Viscounts will become possible with delivery of the fleet of 806s which the Corporation has on order—18 in all. After much investigation, B.E.A. have adopted a basic two-class layout for use in the 806 as an alternative to the all-tourist configuration, and this will mark the introduction of mixed-class service by B.E.A. for the first time. The arrangement is for 12 first-class passengers two-by-two in the rear and 47 tourists forward. This type of service will be introduced on routes to Zurich and Geneva on May 1; to Copenhagen, Oslo and Stockholm on July 1 and to Paris and Nice on August 1 when the Paris "Silver Wing" service will terminate.

In preparation for the coming of Vanguards in 1960, B.E.A. are to fly an Elizabethan with Tyne powerplants and propellers, almost identical to the Vanguard installation, for a total of 2,000 hours on simulated airline operation. Conversion of this aircraft, G-ALZR, is being done by Rolls-Royce and should be complete by the end of August. B.E.A. flying crews and ground engineers will work with Rolls-Royce on the programme which will be based at Hucknall and Malta. Another Elizabethan, G-AKRD (the second prototype), is to fly with Tynes in May and will be used to continue general development flying which began in 1956 with the Lincoln. Before the Vanguard enters airline service, in 1960, the Tyne will have accumulated about 10,000 engine flying hours.

New Thinking on Navaids

ON March 27 and 28 the Institution of Electrical Engineers held a convention on radio aids to aeronautical and marine navigation. The meetings were, after the opening session, broadly divided into four subjects—medium- and long-range aids, range and bearing systems, airfield approach guidance problems and ground radar systems.

The subjects of the many papers given at the convention included Decca, radio altimeter techniques, inertial navigation, Doppler systems, Tacan and approach radar; two papers surveyed radio aids in general.

In his opening address to the Convention, Lord Douglas, chairman of B.E.A., made two main points. The first was to the effect that an integrated "weapon system" kind of approach should be made to civil aviation navigational-aid and air traffic control planning. The second was that a new international organization, at the highest level and using the best experience, should be set up in order to get things done.

The "weapon system" simile was used because in such a system a military aircraft is planned and designed as a whole from the start and this is how, Lord Douglas said, we should start to think—in terms of a Civil Aviation Operations System. The operation of jet transports will, because of lack of planning, be penalized to an extent which would not have applied had the research and development of their operational environment been carried out with the intensity that has been applied to the development of the aircraft themselves.

"The United States," Lord Douglas said, "are engaged on a programme of implementing fairly conventional radio and other devices in their country over the next few years. It will cost them several hundred million pounds. If you talk to their planners they will readily agree that the system they are installing will not really meet their operational requirement, but they have no option but to get on with what they've got. At the same time they are spending millions of pounds on research and development. . . ." Of this country, he added that the amount of money being put into air traffic control reasearch and development was very small indeed.

But, Lord Douglas continued, whatever is done nationally, no progress will be made unless there is international agreement on the subject, and he did not think that ICAO, as at present constituted, offered much scope for reaching such agreement. The position of the U.S.A. and the work being done there was impressive, but that country did not have "a monopoly of good ideas or good planning."

"What happens," asked Lord Douglas, "when these matters come to be discussed at ICAO? The United States will put forward for adoption as an international standard the policy it has decided on to meet its domestic problems. Other states, as is their right, may not agree that what suits the domestic policy of the United States is necessarily best for the rest of the World, and will submit alternative proposals. The United States representatives will be unable to accept alternative proposals, since, as likely as not, the ironmongery to implement their domestic policy is already being produced.

"The discussion," he continued, "cannot be truly objective and scientific as befits a matter of such technical complexity, but becomes a political matter based on briefs previously determined. . . . The best that can be expected is a reluctant agreement reached years after the need dictates. . . ."

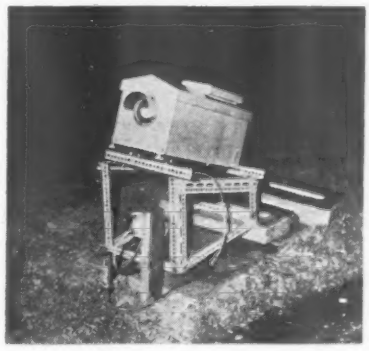
Lord Douglas envisaged a supra-national body of individuals who would be chosen by, say, the president of ICAO, for the special contribution which they could make to resolving the problems. In addition to technicians there would be one or two airline captains and control specialists having an aptitude for such work and being receptive to the objective scientific approach. This body would be given the task of producing, within two or three years, detailed specifications for the Civil Aviation Operations System. From these, manufacturers in any country could produce equipment. Any promising idea, system, or equipment, from whatever source, would be examined and contracts for research and development placed with any competent organizations. A great deal of money would be needed—but probably no more than would be spent in any case in isolated pockets of national research.

FRENCH PRODUCTION.—The first production Sud-Aviation Caravelle is scheduled to fly in May, followed by two more this year. This new picture shows the first two Caravelles for Air France on the right, and two more for S.A.S. on the left, in the Saint-Martin works at Toulouse.

Preparation for a Helicopter Future

DEMONSTRATIONS last week of the B.E.A. Helicopter Experimental Unit's approach lighting system were interesting, primarily for a reason not entirely concerned with the lighting system itself. The talks with pilots and technicians at Gatwick and a short flight in a Bristol 171 Sycamore gave an onlooker some very real idea of the quiet progress being made in this country towards the realization of practical all-weather helicopter operations.

The outing and the flights were planned as a means of showing the approach lighting pattern by night—and, incidentally, of demonstrating the Decca Flight Log as a positioning and approach aid for helicopters. The conditions on the day (or night) turned out to be fairly marginal so we were, perforce, shown something of the all-weather performance which—subject to acceptance of the reliability of one engine and of an unsupported navigational aid—can already be offered by the helicopter.



One of the two approach-angle indicator lights, which are located at the ends of the main crossbar in the system.

Photographs copyright "The Aeroplane"

During the period of my own short flight the lowest cloud layer (about 5/8ths) was at 370 ft., and at 800 ft. all sight of lights on the ground had been lost. After an initial circuit of the landing area (just to the north of the old Gatwick "beehive" terminal building), Capt. J. Reid took the 171 out to the north-west, climbing into cloud, and made a wide approach circuit at 1,000 ft. or so on normal gyro instruments and with the help of the marked tracking by the Flight Log on the special chart. This chart showed where the turn-in should be completed and the heights at successive points during the final run-in. As we broke cloud at 400 ft. or so the approach lighting pattern was there before us.

The flights were made in a 171 because this permitted the passengers a view ahead. Much of the work on night-time and bad-weather approach technique is being done by B.E.A. with an S-55 which has auto-stabilization equipment. Work is also being done on flight-director-type instruments designed to deal with the particular problems of helicopter control in instrument-flying conditions. In fact, these problems do not appear to be particularly difficult in normal flight with present-day helicopters, but the situation can be much more critical at airspeeds below about 30-40 knots, when the handling is complicated by the fuselage's lack of natural directional stability. New variants of flight-director indication are likely to be necessary for helicopters—as well, perhaps, as new thinking "inside out" or "outside in" instrument concepts.

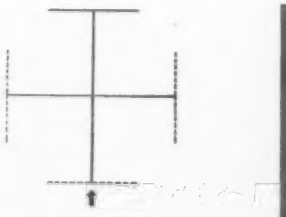
The B.E.A. approach lighting, which has been supplied and installed by the General Electric Co., can best be described as being similar to a foreshortened, two-bar Calvert system, giving a Cross-of-Lorraine pattern. On a helicopter landing site (IATA's 200 by 400 ft. area) there might be a 220-ft. centre-line, with two bars—the main one 200 ft. wide, and the second about 100 ft. wide, and with a system of floodlights illuminating the landing area, which is immediately in front of the main bar. Unlike the more normal systems, the approach lights are necessarily flush with the ground.

A Tarmac landing area would be painted in chequer-board pattern in order to provide better means of depth perception for the approaching pilot. At either end of the main cross-bar there are approach-angle indicators designed to give a green light if the correct angle (15-20°) is being held, to show a red light if the approach is being made too low, and a yellow (or amber) light if it is being made too high.

With a permanent system, when approaches can be made from any direction, there would, in fact, be a lighting arrangement involving two long bars in the form of a cross, with, at each end of each bar, a short bar, which would be switched on, or not, according to the approach direction demanded. In the accompanying diagram, the basic light arrangement is shown in solid line, with the broken lines showing the unlit bars which, when switched on individually, would provide the Cross-of-Lorraine pattern in any one of four directions.

This particular cross-bar arrangement has been found from experience to provide the best form of guidance, for heading and roll attitude and for drift and height-gauging, during the final approach. The experimental equipment uses lights of about 400 c.p., but for regular bad-weather daylight work the intensity would be stepped up to 2,000 c.p. or more.

Full-scale helicopter operations in all weathers must await the appearance of multi-engined aircraft and of some additional navigational system to act as back-up for the Decca. One of the problems is that, with operations at low altitudes, the value of UHF or VHF navaid systems is limited. Some kind of micro-wave beam system may be an answer both for precision approach and as a final back-up for the basic navigational equipment.—H.A.T.



The approach-lighting pattern at Gatwick with the well-known beehive terminal faintly discernible in the background. An S-55 is hovering over the floodlit landing area just behind the main crossbar. The diagram above shows the lighting pattern, which is explained in the text.

A Bea-line to Moscow

This article by W. E. CASLEY *describes the recent visit to Moscow of a British delegation to discuss the Anglo-Russian air agreement. The observations made and opinions expressed are the author's own and do not necessarily reflect official opinion.*

THE prospects of a visit to Moscow had been in all our minds for several days and the detailed planning which such a project involves had gone ahead with considerable drive and enthusiasm. Most of this enthusiasm seemed to have vanished, at least for the moment, from the first arrivals at the B.E.A. Continental Departures desk at London Airport. In my own case this was undoubtedly due to the misery of having to leave a warm bed at 04.45 hrs., crawl into a taxi at 05.15 and drive through cold, dark, deserted streets in order to arrive at L.A.P. before 06.15 hrs. Even the Customs officials seemed sympathetic towards the party as it made its way out to Viscount G-AOHO.

This was an 802, substituting for an 806 which should have made the trip, but had been temporarily grounded the day before with some minor reduction gear trouble. Perhaps that was just as well since the original callsign of "Yankee Hotel" might have seemed a little inappropriate to Controllers on the other side of the curtain; but it meant that our planned cruising speed was down by about 20 knots and that our range would be insufficient to turn back from Moscow to Copenhagen if, for any reason, we could not land at Moscow.

We moved off at 07.06 hrs. G.M.T., with E.T.A. Copenhagen 09.28 and, once settled down in comfort and warmth, spirits began to rise again. Breakfast, served over Clacton, was a welcome sight and before it was cleared away we were over the flat snow-covered fields of Holland. The weather was reasonably clear and visibility was of the order of 15 to 20 miles. The landing at Copenhagen was three minutes late and, with only a 40-minute turn-round, there was to be no spare time on the ground. The meteorological forecast for Moscow showed a "low" centred almost over the city; snow showers were predicted with cumulus up to 18,000 feet, mainly 8/8ths. The usual air of conviction about the forecast was lacking, since Copenhagen Met admitted that they had missed most of the TAFOTS that morning through poor reception.

We were on the move again at 10.17 hrs. G.M.T. and airborne at 10.23. The estimated flight time was 3 hours 35 minutes and very little calculation was needed to show that this would leave only about 40 minutes of daylight in hand when we arrived at Moscow, where local time is G.M.T. plus 3.

Russian air traffic regulations required us to make contact with Riga Regional Control Service (the equivalent of our Flight Information Centre) when 100 km. (62 miles) from the Russian border. Our route had been laid down as Copenhagen — Ventspils (Latvia) — Riga — Sigulda — Karsava — Velikiye Luki — Klement'Yevc — Moscow/Vnukovo and our planned entry height was 8,000 m. (26,250 ft.). From the time that we came under their effective control we would have to adopt a new set of air traffic procedures. ICAO quadrantal heights are not used; instead, the compass rose is divided into semi-circles. On true courses of from 0° to 179° the mandatory heights are from 600 m. (1,970 ft.) to 6,000 m. (19,700 ft.) in 600-m. intervals, and from there on, 2,000-m. (6,560 ft.) intervals are used up to 20,000 m. (65,610 ft.). From 180° to 359° T the first available altitude is 900 m. (2,950 ft.) continuing by 600-m. intervals up to 5,700 m. (18,700 ft.). The next altitude is 7,000 m. (22,950 ft.) and the 2,000-m. intervals apply again up to 19,000 m. (62,350 ft.). This means that there will be a 300-m. interval between aircraft up to 6,000 m. and, thereafter, this interval is increased to 1,000 m. Standard pressure settings are used, but the datum is 760 mm. of mercury. Distances are in kilometres, vertical speeds in metres/sec. and temperatures in degrees Celsius. Separation is based solely on longitudinal and vertical intervals. Lateral separation is impossible since the aircraft have to adhere strictly to corridors which are 20 kilometres (12.5 miles) in width. Longitudinal separation is 10 minutes for piston-engined aircraft and 30 minutes for jets.

Our big moment came at 11.54 hrs. G.M.T. Our estimated position was then over Ventspils and we had entered the U.S.S.R.—but a continuous layer of cloud below prevented the ground being seen. The outside temperature was now −65° C. Both Riga Regional Control and Riga Airfield Control had answered in good, clear English and the first beacon had come in with an excellent note.

At 12.08 hrs. we were over Riga and here we turned on to

Snow clearance at Russian airports is a major problem. At Vnukovo, this truck-mounted turbojet is used to blast away ice which is first broken up by a tractor-drawn roller. The heat of the jet blast also vaporizes residual ice.

General Zakharov, deputy chief of Aeroflot, poses in front of the B.E.A. Viscount 802, itself posed in front of the airport terminal at Vnukovo, which is now Moscow's primary international airport. Also at Vnukovo is a production plant which has recently converted from manufacturing Il-14s to Il-18 turboprop transports.

066° to follow the short dog leg to Sigulda, the next authorized turning point. At 12.14 we turned back on to 099° and headed towards Karsava. All the turning points are marked by non-directional beacons or D/F stations and each beacon was said to have a guaranteed range of over 150 km. (93 miles). This had the effect of ensuring that we were never out of range of a beacon. Before the last one had faded the next was coming in strongly. At our height, their effective range was in fact nearer to 250 km. (155 miles).

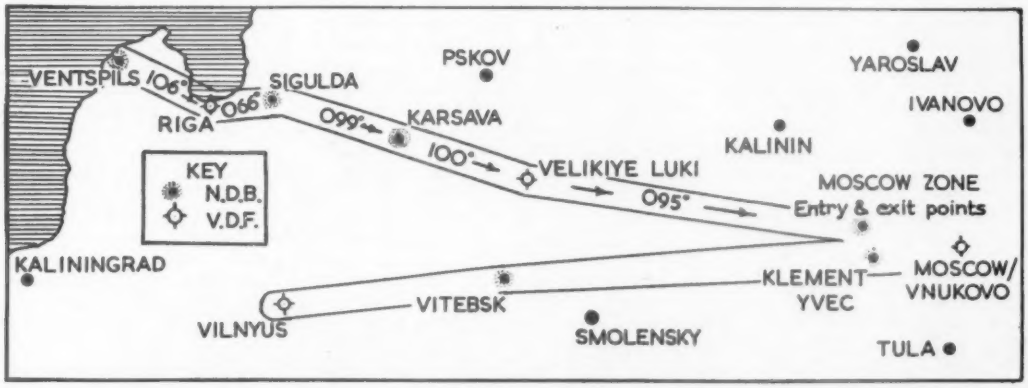
By now we had received permission to increase our height and were climbing gently upwards from 8,000 to 10,000 m. (32,800 ft.). The reason passed down from the flight deck was that this would provide an increase in speed or range or both. Privately some of us wondered whether it might not be to settle once and for all the theory that an 802 would not get up there; or perhaps 10,000 m. was a pleasantly impressive figure to quote on all future position reports. Whatever the reason, up we went. Having got there the next Control Station was more than a little sceptical and twice asked for confirmation of the fact that we meant metres and not feet.

At 12.54 hrs. we were over Velikiye Luki and the time had come to change over to Moscow F.I.C. The air was so smooth and the solid cloud base was so far below that the aircraft seemed suspended and stationary. It was here that we finally lost touch with the Swedish Decca chain which had been a most useful navigational check all the way along the previous sector. Our E.T.A. was now 13.50, eight minutes better than the original figure. Altitude was still 33,000 ft., cabin pressure 9,000 ft. and outside temperature −60° C. Moscow weather was now 7-10/10ths, 1,000 to 1,500 ft. cloud base, intermittent snow showers.

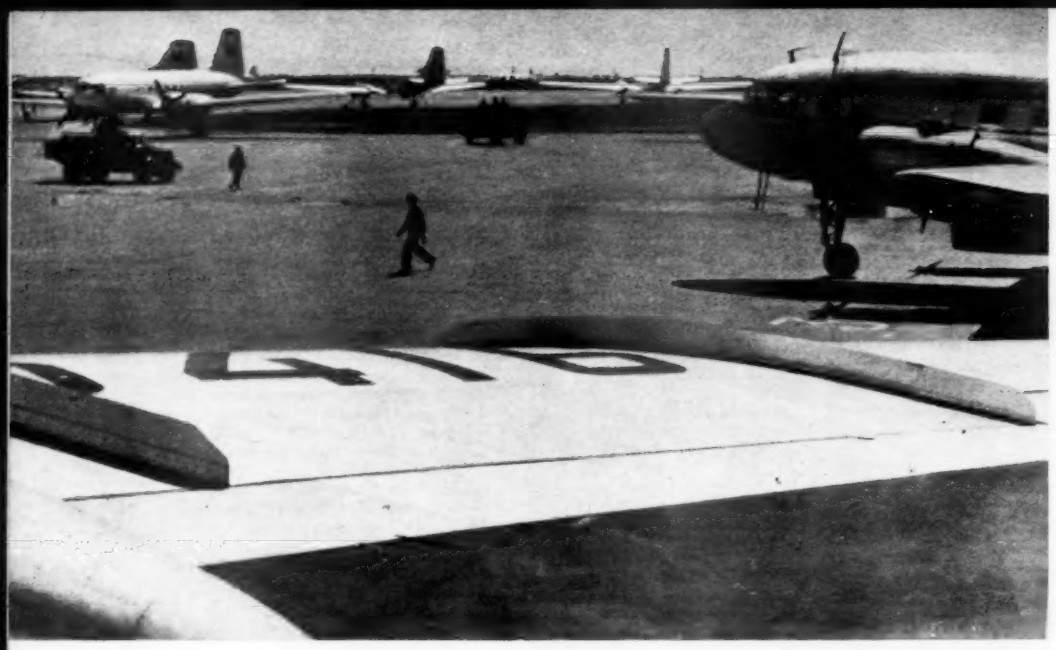
At 13.25 hrs. we began to drift gently down and by 13.50 were at 7,000 ft., just above the tops of the clouds which looked full and dark down sun. From now on, and for some time to come, the proceedings were a little difficult to follow. We started off flying almost into the sun; five minutes later we were on the reciprocal. At 14.00 we dipped into cloud and then came out again and held just on top. At 14.08 we were still holding, although now down to 6,000 ft., and mental arithmetic seemed to indicate that there was a rapidly diminishing supply of daylight down below, wherever that was. At 14.12 the Viscount put its nose firmly down into the cloud and five minutes later, still in cloud, faint icing was visible on the inboard leading edge and nacelle.

We broke cloud at 14.19 hrs. and could see nothing but thick snow on the ground. From up front there may have been something to be seen, but from the port-side passenger seats there was nothing but white inhospitable-looking wilderness and occasional woods, without even a farmhouse to break the monotony. Also, the light was fading. Then a couple of red lights came into view and at 14.27 the aerodrome was seen for the first time. At 14.28 we touched down on the 3,000-m. main runway at Vnukovo.

The preceding 38 minutes had seemed rather a long time to



This map shows the two corridors into Moscow. The Viscount 802 arrived by way of Ventspils in Latvia, and found that the Swedish Decca chain could be received as far as Velikiye Luki.



The sight of Il-14s "scattered about in dozens," as noted by the author, is a common one at Vnukovo—partly, perhaps, because a factory on one side of the airfield has until recently been turning out several dozen a month. This picture of Il-14s was taken last summer, from the window of a Tu-104.

the unfortunates in the back end—especially to those with sufficient experience and imaginations fertile enough to imagine what might have been happening. However, we were down on Russian soil and were, we believe, the first British civil aircraft since before the War to have come through to Moscow without a Russian crew to help. It had always been the rule previously that a Russian crew came on board, usually at Berlin.

As the Viscount backtracked down the runway all eyes were at the windows. The apparent size of the aerodrome was increased by the uniform blanket of snow which covered everything except the runway itself, which was perfectly clear. The same could not be said of the taxi track and considerable power had to be used at times to keep the aircraft on the move. There were parked aircraft everywhere, at least seven of which were Tu-104s, whilst Il-14s were scattered about in dozens. Snow ploughs were active in many areas and the first impression was that of a well-filled aerodrome with a very active snow clearance programme.

At last we stopped. A gangway was wheeled up to the aircraft and, as the door opened, a Russian officer stepped aboard. In response to his request, made in English, we obediently handed over our passports and filed out into the growing twilight. After an English winter the air struck keen and cold. A large crowd was gathered below and cameras and flashlights were much in evidence. Some members of the party were shepherded to a microphone and interviewed on the spot. Scores of officials and aerodrome workers swarmed around the Viscount, which made a brave sight. The Union Jack on the tail showed clear and clean against the background of whiteness and the whole aircraft seemed suddenly imbued with an aura of solid respectability.

Customs formalities were waived, for which we were duly appreciative, and at long last we were ushered into a bus. The baggage was piled in after us and the 35-kilometre (22-mile) drive to Moscow began. By now it was quite dark and it was almost impossible to see much of the countryside. It was, however, particularly noticeable that the road was almost clear of snow all the way. The most remarkable sight on this drive was of seven-storey flats being built on the outskirts of the city. Batteries of floodlights illuminated the scene and work was still going on despite the darkness and a gentle snow shower which had started. We were to find this kind of activity typical of Moscow. Minor details such as snow and darkness are not allowed to interfere with work which is considered essential.

The next morning we all assembled at the Aeroflot administrative building in Vnukovo to meet our opposite numbers and to hear an account of the organization and work of Aeroflot from its deputy chief, General Zakharov. It is much more than an airline as we understand the term. Aeroflot operates as a Ministry in its own right and is attached to the Council of Ministers of the U.S.S.R. Marshal Zhigarev (head of Aeroflot) has all the responsibilities of a Minister, yet Aeroflot is a commercial organization and operates on its own revenue. As well as operating airlines it trains all its own air and ground staff and everything at Vnukovo was built by Aeroflot. Its radio and A.T.C. organizations cover the whole of the U.S.S.R. It operates all the necessary civil aerodromes within the Union. In fact, Russian civil aviation and Aeroflot are administratively and operationally synonymous.

All the services are paid for by revenue received from the commercial side, but General Zakharov was emphatic that a profit was made. He went on to say that at some remote aerodromes no technical staff at all are employed. Radio aids to navigation and aerodrome lighting are switched on automatically and there are even automatic meteorological stations which function without attention except at long intervals. It was interesting to learn that the largest proportion of Aeroflot staff are in the radio grades. One self-evident point was that large sums of money and large numbers of staff and vehicles have to be used for about five months of the year on snow clearance. To offset this the General remarked that Moscow was singularly free from fog, a condition which he understood was not shared by London.

At the conclusion of this meeting we paired off with our Russian equivalents and began the process of making each other's acquaintance, mostly through the medium of interpreters. Then it was announced that this process was to be taken further and, it was hoped, facilitated by an official luncheon. This followed what everyone has learned to know as the traditional Russian pattern, punctuated by speeches and toasts. This was our introduction to vodka. When pancakes and cream appeared it seemed reasonable to assume that the meal was over, but this was our first lesson in not taking things for granted. The pancakes were followed by steaks and more toasts. The luncheon finished at about 4.45 p.m. and at its conclusion the leader of the M.T.C.A. technical party produced a ploy that Stephen Potter would have given much to have created. He suggested that if the social formalities were over for the day we might as well go back to work. We did, too!

Our hosts were to prove most co-operative and helpful. A sufficiently large team of interpreters was conjured up and most of them had an adequate grasp of English and the subject under discussion. Naturally, the necessity for translating every question or answer makes for slower work, but a surprising amount was accomplished on the technical side. All our requests for information were met wherever possible and we were given the run of the aerodrome.

It would be invidious and ill-mannered to attempt to draw comparisons between their organization and our own. Instead, it can do no harm to highlight one or two items which were to us particularly interesting or impressive. One such item was in the Control Tower. Instead of using the conventional PPI tube, two or three positions were using a daylight-viewing closed-circuit television screen fed from the PPI tube. Downstairs in the Meteorological Office a small television camera is permanently focused upon a board which carries paper slips showing the current weather situation at all the aerodromes within the

(*Continued on page* 473)

(*Continued from page* 472)

Moscow Control Area. These slips are renewed every half hour. By turning a switch on his screen the Controller can thus change from the current traffic pattern to a picture of the current weather.

Another interesting device was housed in the Meteorological Office. This took the form of a direct-reading visibility meter, calibrated in metres. Connected to it was a paper roll on which a pen made a moving trace not unlike a recording barograph. By this means the visibility at any given moment could be read off the dial whilst a permanent minute by minute record of the visibility was preserved on the paper roll. It works by receiving light reflected back from a fixed source into a photo-electric cell and passing the resultant current through a galvanometer. Incidentally, the Hydrometeorological Service of the U.S.S.R. is independent of Aeroflot and stands on its own with Ministerial status.

Clearing the Snow

One of the most impressive sights on the aerodrome was the combination of machines used for snow clearance. Ordinary snow ploughs move the snow out to the edge of a taxi track. Special ploughs then move into these banks and pass the snow up through a chute and discharge it into lorries which queue up behind the plough. When they wish to remove the residual ice from the apron or parking area a large and heavy roller, about five feet wide and four feet high, studded with iron spikes about five inches long, is drawn by tractor over the area.

This is then followed by a large lorry which has a fuel tank of several hundred gallons capacity mounted on the back and a jet engine with a fish-tail nozzle mounted on the front. This jet—which may well have been a Nene—is then opened up and most of the already fractured ice sheet disappears in a blast-driven shower of fragments, to be swept up by the waiting ploughs. The remaining small amounts of ice left on the ground are then vaporized by the heat of the jet stream. The Russians claim that this device will clear away ice at temperatures down to −25° C., and one can well believe it.

Four more days of genuinely hard work then ran their course. Aeroflot looked after us handsomely. A bus was waiting at the hotel each morning to take the main party down to the aerodrome and bring them back again at night. A memorable luncheon had been staged and some of the more fortunate had a smaller repeat effort the next day. Our flood of questions had been received with patience and fortitude. To round off our trip they even managed to contrive a surprise for us for our homeward journey.

Most of us were to leave on the Monday, six days after our arrival in Moscow. We had, we thought, booked seats on the Tu-104 to Copenhagen, to connect with the B.E.A. scheduled service from there to London. Our original Viscount had already returned, as it was urgently required back here. Understandably we were a little disconcerted when, on going to the hotel Intourist office to collect our tickets, we were told that there was no 12.15 service to Copenhagen that day. When the babble had died down a little the Intourist girl clerk pacified us by saying that a Tu-104 would be going to Prague at 12.15 (Moscow time) and that also connected with a B.E.A. Viscount to London.

Logically, as we thought, we asked the girl to change our tickets for Prague instead of Copenhagen. She said that she was sorry, but that she could not do that. The babble broke out again. When it subsided once more she explained, with an angelic smile, that they could not be changed because they were already made out for Prague. Evidently she too was not entirely ignorant of "one-upmanship."

But there was more to come. After we had arrived at the aerodrome and had had passports checked, baggage weighed, boarding cards issued, and had surrendered our few remaining roubles for a piece of paper—which is probably still baffling the cashier at home—we learned that this Tu-104 wasn't going to Prague either. The result—more babble! After they had explained that the weather at Prague was below minima for a Tu-104 we were offered seats on an Il-14 which was due to leave at 13.40 (M.T.) and to arrive at Prague, via Vilnyus, about three hours after the Viscount had left. Minor problems then were the lack of visas for night stopping in Prague and a total absence of Czech money. We unloaded those by telephone on to the British Embassy without delay.

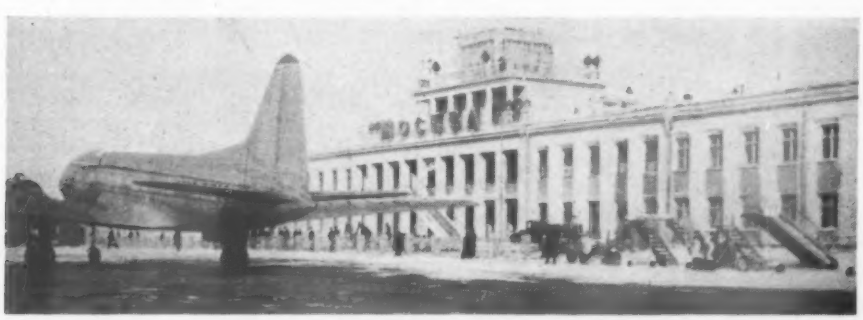
The Ilyushin Il-14 is a sturdy and robust little aircraft. All the seats were filled, 27 of them, and we were airborne at 13.50 hrs. after a ground run of only 17 seconds. By 14.21 we were in cloud at 2,500 m., which was to be our "quadrantal" height for the run to Vilnyus. At 15.18 (M.T.) we were over Vitebsk in V.M.C. At 16.07, still at 2,500 m., our stewardess, who not long before had given us a small glass of lemonade and a small piece of toasted cake, ordered safety belts to be fastened. She spoke a fair amount of German, in addition to Russian, so we were not entirely in the dark as to what was going on.

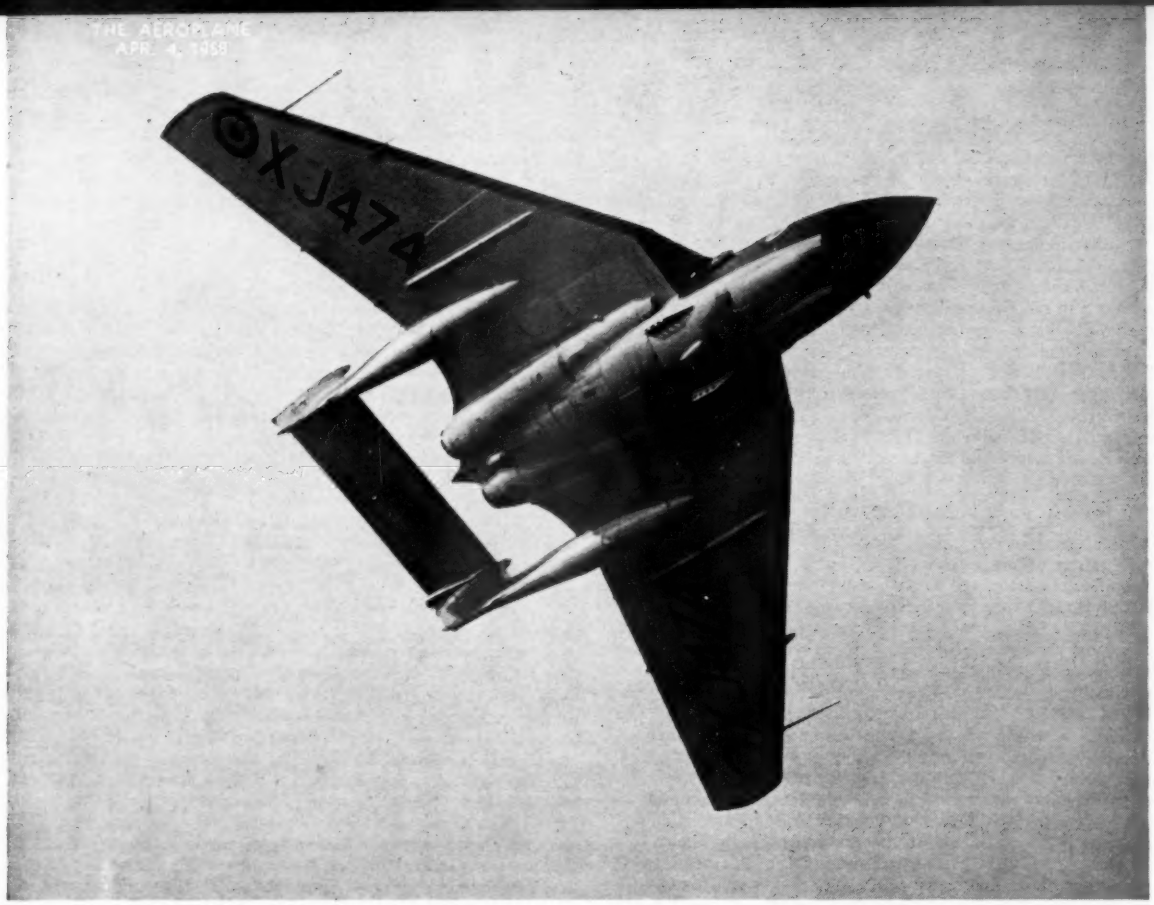
It was most noticeable that once our Russian pilot had begun his descent he never touched the throttles again until a second or two before we touched down at Vilnyus at 16.25. This aerodrome has one 1,200-m. tarmac runway with excellent approaches. Here the snow had been compacted instead of cleared and braking action was correspondingly reduced. The Ilyushin seems to need very little room because we pulled up with plenty to spare. Obviously someone had signalled ahead because an Air Traffic Controller was waiting for us and to our relief he had a very good command of English. Our passports were collected, and we were taken upstairs to a very tastefully decorated restaurant. Here another surprise awaited us—an excellent four-course meal was served with a speed that left us gasping. In the hotel at Moscow we had become accustomed to waiting over two hours for a simple meal—here twice as much was served in a third of the time. Vilnyus deserves to prosper; it is clean and attractive and the passenger building is only about three years old. The staff, as far as we could see, are well trained and efficient.

At 17.39 hrs. (M.T.) we were airborne again and at 19.00 Warsaw was visible to the North. Never in my wildest moments had I expected to be sitting in a Russian aircraft over the middle of Poland heading for Czechoslovakia.

We landed at Prague at 21.22 hrs. (M.T.) in darkness with moderate snow falling, and all ended happily. A senior member of the British Embassy was waiting for us, money was available and transit visas were organized. To complete the picture the Viscount was still there; it had developed an electrical snag that afternoon. It left at 08.22 hrs. G.M.T. next morning and we were on board. When we arrived at London at 11.10 people thought they were having a snow storm. It was difficult to repress the temptation to comment on the mildness of the temperature—but that really is how it felt.

Now that it is all over we find that we have learned much about the way Aeroflot works. We have an understanding which never existed before and, barring unforeseen difficulties, there seems to be every prospect of this goodwill being fostered in the future.





Building the Sea Vixen

In February, 1955, the D.H. 110 was ordered into production. For some time the new fighters have been coming steadily off the production line at Christchurch, to replace the Sea Venom as the Royal Navy's standard all-weather fighter.

ALTHOUGH production of the original D.H.110 was planned for Hatfield, where jigging and tooling policy was initiated, the design and production of the Sea Vixen in its naval trim (wing-fold and long-stroke undercarriage excepted) has been the responsibility of de Havilland, Christchurch.

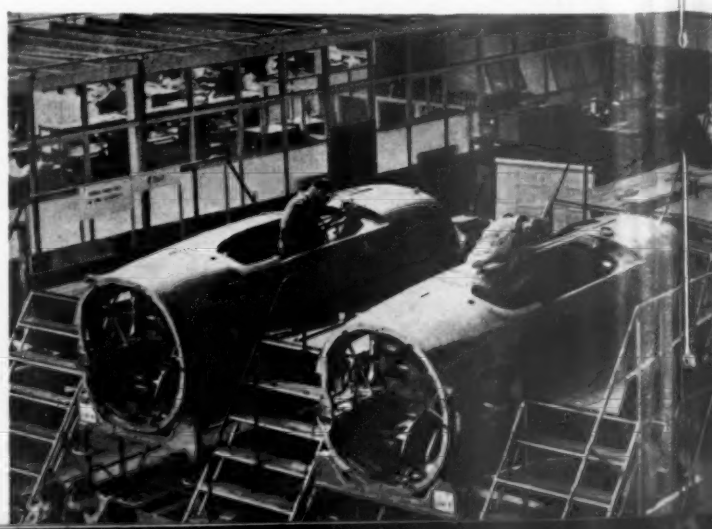
The extent of this responsibility becomes apparent, however, only when it is realized that naval requirements—arrester hooks, nosewheel steering and many other features too numerous to mention—have involved re-design of more than 80% of the original aircraft. The elimination of the Aden guns and the adoption of the D.H. Firestreak are also major design changes.

Sea Vixen production problems bear little similarity to those of the Vampire and Venom variants which had previously been the main preoccupation of the Christchurch factory. The fact that several Venoms could be manufactured in the man-hours required to build one Sea Vixen puts the problem in perspective.

Constructional methods used are more akin to those of the Comet; for example, the use of Redux bonding and the adoption of extensive contour etching were matters on which Christchurch could draw on Comet experience. Naval experience had been gained over the years and readers may remember carrier trials with the Sea Mosquito in March, 1944. Next came the Sea Hornet, then the Sea Vampire—which on December 3, 1945, became the first jet aircraft to fly from a carrier—and finally the Sea Venom which is today the first-line all-weather fighter of the Royal Navy. All these aircraft were developed under the direction of the de Havilland Christchurch chief designer, Mr. W. A. Tamblin, F.R.Ae.S., A.M.I.N.A.

The existence at Christchurch of closely knit design and production teams working literally side by side in a well-laid-out and compact factory was an advantage. The proximity of the de Havilland Portsmouth factory, where a large proportion of the initial manufacture and assembly is done, and of Folland (at nearby Hamble), who with D.H. Portsmouth manufacture stub and extension wings, was advantageous.

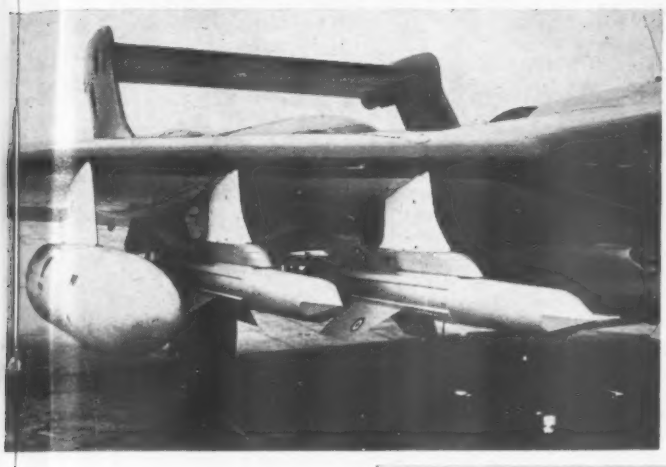
De Havilland at Hatfield also was available in case of need, and in fact designed and made the first folding wing: Hatfield also designed the long-stroke undercarriage. D.H. Hatfield is



now making the glass fibre radomes; de Havilland Propellers, Ltd., is fabricating the entire undercarriage.

The aim has been to produce an aircraft with a sturdy structure capable of a long and useful Service life and one, moreover, capable of employing a large amount of operational equipment and " black boxes," yet yielding nothing to the needs of servicing, serviceability and naval stowage requirements.

Erection follows a conventional pattern. The fuselage is boxed round the keel, equipped completely and pressure-tested; it is then moved on to the assembly track where the stub wing—which alone accounts for more than half the total man-hours—is waiting. Tail booms are added; extension wings and tailplanes follow in logical sequence.



The stub wing, in which the two Rolls-Royce Avon engines of recent mark are buried, presents an unusually interesting structure. It is built up from extruded boom sections, fire-walls being of titanium or stainless steel. Special attention has been given to the problems of heat dissipation. The skin—at present milled, but later to be contour-etched—is of light alloy (¼ in. nominal thickness) strengthened by transverse stringers, of milled extruded section. Some of the stringers in the region of the fuel tanks serve a dual purpose, acting both as structural members and as pipes—e.g., in the fuel-venting system.

The wing-fold is a particularly fine example of precision engineering. Latch tolerances are of the order of 0.0004 in.; and a final scratch-free polished surface is obtained.

Twelve heavy-duty high-tensile steel forgings are used for the hinge and latching units, great care having been taken to spread the loads. In the area of the wing fold, for instance, anchor straps extend from the latching units and these mate with alloy diffusers which transfer the load into the skins.

The ribs at each side of the wing-fold are machined from forged billets of 1½-2 in. original thickness. Webs vary from 0.70 to 1.10 in. (nominal); strong points are left at 1.10 in. or thereabouts where integral stiffening is required, for example where two high-tensile steel forgings carry wing-fold jacks.

Tail-boom construction is conventional. At the fin-head the light-alloy side panels are extensively etched; the all-flying tail-plane, however, reverts to the more normal milling process used on the stub wings.

Spin-dimpling is used extensively in the riveting of Sea Vixen components. This method is an advance on the old draw-sink

Left, a large well-swept wing together with comparatively short tail-booms are characteristic features of the Sea Vixen's "geometry." Above, Firestreak air-to-air guided missiles are standard armament for this new all-weather fighter for the Royal Navy.

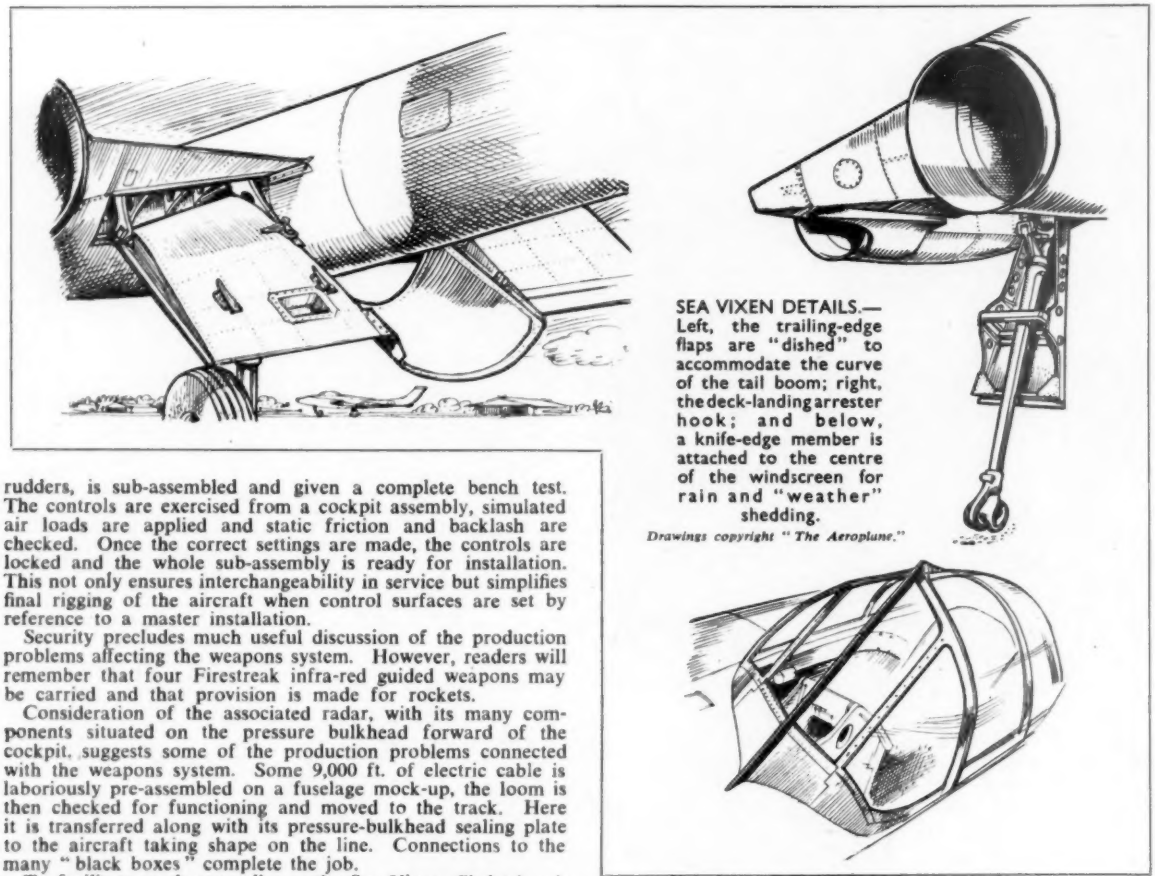
Right, a straight wing-fold is used with a hinge just outboard of the undercarriage bay; note in this view the observer's window just by the intake for the starboard Avon turbojet. Below, the production line of Sea Vixen fuselages at Christchurch.

method and is widely used on heavy-gauge material in preference to counter-sinking. This process avoids lost metal inherent in counter-sinking, eliminates stresses, and reduces fatigue problems. It also avoids " coining " and deburring.

Dimpling has been found suitable for use on light alloy up to 16 s.w.g., although of course laminated spot-welded sub-assemblies can far exceed this thickness. Five laminations, each of varying thickness if need be, can be nested successfully without loss of fusion in the finished product, but bend allowances for each gauge must be made when tooling-up. Spin-dimpled laminations of four thicknesses are by no means uncommon in the Sea Vixen.

Close control and inspection are exercised over the process, and test sections are regularly viewed through an epidiascope providing magnification of 7½ times. This ensures a uniformly high standard of work. Finally, as would be expected on high-performance aircraft, exterior rivet and bolt heads are milled flush before painting.

To eliminate snags in advance, the fully duplicated power-control system. along with the associated " q-feel " for the



SEA VIXEN DETAILS.—Left, the trailing-edge flaps are "dished" to accommodate the curve of the tail boom; right, the deck-landing arrester hook; and below, a knife-edge member is attached to the centre of the windscreen for rain and "weather" shedding.

Drawings copyright "The Aeroplane."

rudders, is sub-assembled and given a complete bench test. The controls are exercised from a cockpit assembly, simulated air loads are applied and static friction and backlash are checked. Once the correct settings are made, the controls are locked and the whole sub-assembly is ready for installation. This not only ensures interchangeability in service but simplifies final rigging of the aircraft when control surfaces are set by reference to a master installation.

Security precludes much useful discussion of the production problems affecting the weapons system. However, readers will remember that four Firestreak infra-red guided weapons may be carried and that provision is made for rockets.

Consideration of the associated radar, with its many components situated on the pressure bulkhead forward of the cockpit, suggests some of the production problems connected with the weapons system. Some 9,000 ft. of electric cable is laboriously pre-assembled on a fuselage mock-up, the loom is then checked for functioning and moved to the track. Here it is transferred along with its pressure-bulkhead sealing plate to the aircraft taking shape on the line. Connections to the many "black boxes" complete the job.

To facilitate work generally on the Sea Vixen, Christchurch has built a number of docks similar to those used for servicing airliners. These docks, constructed from Dexion slotted angle, to span the Sea Vixens on the production line (and, incidentally, in the flight shed), not only eliminate the need for a clutter of ladders and trestles but also preclude needless clambering about on the aircraft to the detriment of the finish.

Each dock is fitted out with intercom., and hydraulic, pneumatic and electric points are to hand. In addition a push-button-operated klaxon and associated flashing lights are available to give warning of impending functional tests—a useful safety precaution.

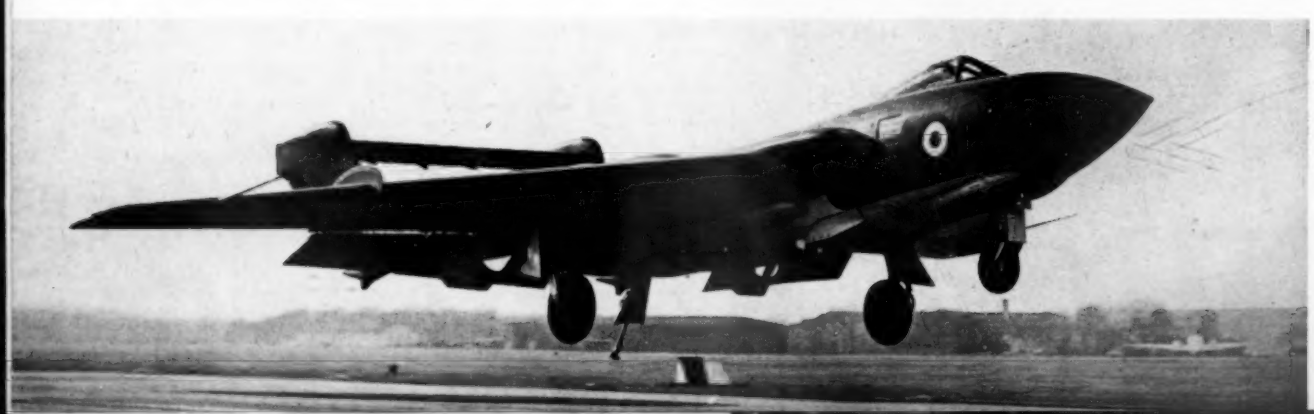
The adoption of the dock system has also simplified man-management. Tradesmen, whose physical separation previously made co-operation difficult, can now work more closely together, using throat microphones and the intercom. system. Similarly from a central "bridge position" the foreman can effectively captain his crew. These and many other innovations are helping to speed production.

Sea Vixens now coming off the line embody all the main production features. Future policy will be to go further and deliver each aircraft as a complete weapons system with every item of equipment—radio compasses, radar, "black boxes," Firestreak weapons—and, on later aircraft, flight refuelling—fitted and tested, ready for operations. This new and radical alteration in policy involves major changes which are now being implemented.

All this represents interesting work and good employment for Christchurch on an aircraft which possesses great flexibility and a most advanced weapons system.

Among the suppliers of materials and equipment for the Sea Vixen are:—

Details and Assemblies: C.J.C. Developments, Ltd.; W. J. Best and Son; Caffyns, Ltd.; DIAC (Aircraft), Ltd.; Frenchay Products, Ltd.; Green Pennant Engineering Co.; Moore's (Bournemouth), Ltd.; Morfax, Ltd.; Presland and Partners, Ltd.; Precision Engineering (Bournemouth), Ltd.; Redthorn Engineering Works, Ltd.; Royston Engineering Co., Ltd.; Ruffwell Engineering Co., Ltd.; J. O. Ruffhead Engineering Co. **Castings and Forgings, etc:** Birmingham Aluminium Co., Ltd.; Bretts Stampings Co., Ltd.; Cambrian Castings; The de Havilland Engine Co., Ltd.; Dudley Drop Forging Co., Ltd.; The Fairey Aviation Co., Ltd.; Firth Derihon Stampings, Ltd.; High Duty Alloys, Ltd.; Light-Metal Forgings, Ltd.; H. J. Maybrey and Co., Ltd.; William Mills, Ltd.; D. Napier and Son, Ltd.; Northern Aluminium (1903) Co., Ltd.; Southern Forge, Ltd.; Stampings Alliance, Ltd.; Sterling Metals, Ltd.; J. Stone and Co. (Charlton), Ltd.; Tubes, Ltd. **Component Sub-contractors:** Automotive Products Co., Ltd.; Blackburn and General Aircraft, Ltd.; Dunlop Rubber Co., Ltd.; Ferranti, Ltd.; Flight Refuelling, Ltd.; General Electric Co., Ltd.; Graviner Manufacturing Co., Ltd.; H. M. Hobson, Ltd.; King Aircraft Corpn.; Marconi's Wireless Telegraph Co., Ltd.; Martin-Baker Aircraft Co., Ltd.; Louis Newmark, Ltd.; Normalair, Ltd.; Page Engineering Co.; The Plessey Co., Ltd.; Rolls-Royce, Ltd.; Rotax, Ltd.; Smiths Aircraft Instruments, Ltd.; Teleflex, Ltd.



THE FIGHTING SERVICES

Commonwealth Visit

AIR MARSHAL THE EARL OF BANDON, C.-in-C., Far East Air Force, accompanied by Lady Bandon, is inspecting a number of R.A.A.F. establishments during his present visit to Australia and New Zealand. Arriving at Darwin on March 24 in an F.E.A.F. Hastings, his first visit to the R.A.A.F. was to be to Amberley on March 26 for an inspection of No. 82 (Bomber) Wing, which was being followed by a visit to No. 78 (Fighter) Wing at Williamtown. Squadrons from both of these Wings will come under his command when R.A.A.F. units of the Commonwealth Strategic Reserve move to Malaya.

After attending the celebrations in honour of the 21st anniversary of the foundation of the R.N.Z.A.F. in New Zealand, the C.-in-C. will return to Australia on April 8. He will then inspect R.A.A.F. Richmond before flying to Canberra on April 10. Arriving in Melbourne on April 12 for discussions with members of R.A.A.F. Air Board and other functions, including an address to the R.A.A.F. Staff College at Point Cook, he will visit Woomera and Maralinga before returning to Singapore from Perth on April 21.

Dunning Cup

NO. 228 Squadron (Wg. Cdr. J. C. Graham, D.F.C.) of Coastal Command, based at R.A.F. St. Eval, has been awarded the Dunning Memorial Cup for achieving the highest standard on a course at the Joint Anti-Submarine School, Londonderry, during 1957. Disbanded in 1945, the Squadron was reformed in July, 1954, and equipped with Avro Shackletons.

The Cup was given in 1917 by 50 officers of the Royal Naval Air Service to perpetuate the memory of Sqn. Cdr. E. H. Dunning, D.S.C., the first British officer to land an aircraft successfully on a ship under way. Before the 1939-45 War the Cup was awarded to the officer performing the most distinguished service each year in Naval co-operation. In 1949 the competition was revived, but under changed conditions, the award being presented to the R.A.F. aircraft crew which achieved the best results on the anti-submarine course. The following year the rules were again changed so that the Cup could be held by a squadron.

F.E.A.F. VISITORS.—The C.-in-C., Air Marshal the Earl of Bandon, greeting (top) the Australian Minister for Air, Mr. P. M. Osborne, and (bottom) Mr. Walter Nash, the Prime Minister of New Zealand, during their respective visits last month to R.A.A.F. and R.N.Z.A.F. units stationed in Singapore and Malaya.

RECOGNITION CHAMPIONS.—The sixth annual R.A.F. Aircraft Recognition Competition has been won by the team from R.A.F. Leuchars. Left to right, Flt. Lt. L. S. Naile, Wing Weapons Officer, who obtained the highest individual score; Flg. Off. W. J. T. Oscroft of No. 43 Squadron with the Victor Trophy, and Flg. Off. K. J. Bassett of No. 151 Squadron.

Central Flying School Unveiling

A PORTRAIT of Air Chief Marshal Sir James M. Robb was unveiled in the officers' mess at the Central Flying School, R.A.F. Little Rissington, during a guest night on March 14. Air Chief Marshal Sir James Robb was for many years closely associated with the C.F.S., and was its Chief Flying Instructor from 1927 to 1930 and its Commandant from 1936 to 1940.

The portrait was commissioned by the C.F.S., painted by Mr. Cuthbert Orde, and unveiled by Air Marshal Sir John E. A. Baldwin, president of the C.F.S. Association and Commandant of the School from 1929 to 1932. Among the guests of the C.F.S. Commandant, Air Cdre. N. C. Hyde, were Air Vice-Marshal Sir George Harvey, Air Vice-Marshal J. Cox and Air Vice-Marshal R. Harrison.

No. 85 Squadron

PRESENT members of No. 85 Squadron are compiling a history of the Squadron and request any information or photographs from past members which would help in completing an accurate account. Such information and photographs, which will be returned, should be sent to the Adjutant, No. 85 Squadron, R.A.F. Church Fenton, Tadcaster, Yorkshire.

Royal Air Force Appointments

THE following are among recent Royal Air Force Appointments:—

Wing Commanders: R. J. H. De-Brett, to Headquarters, M.E.A.F., for air staff duties; G. W. M. Dunn, to Air Ministry for duty in the Department of the Air Member for Supply and Organization; J. H. Fowler, to Headquarters, British Forces, Arabian Peninsula, for administrative staff duties; W. O. Hill, to Headquarters, U.S.A.F., on exchange duties; R. G. D. Taylor, to R.A.F. Bridgnorth, for administrative duties.

Reunion

R.N. Seaplane Bases, Port Said and Alexandria, and No. 269 Squadron.—The 36th all-ranks reunion will be held at Stewarts' Restaurant, Victoria Street, London, S.W.1, on April 26. Details from Hon. Secretary, Mr. W. C. Shilling, Selgrove, Kewferry Drive, Northwood, Middx.

Scimitar Service Trials

WITH the planned formation of the first Scimitar operational squadron at R.N.A.S. Lossiemouth on June 3, which is to embark on the Royal Navy's latest carrier, H.M.S. "Victorious," in September, the work of the Scimitar X Flight of No. 700 Squadron at R.N.A.S. Ford is now coming to a close. Formed on August 27, 1957, to undertake the Service trials of the Supermarine Scimitar F.Mk.1, No. 700 X Flight is evaluating it as an aeroplane, and as a weapon system, and is checking its performance for the compiling of range and endurance data.

Until quite recently it has been the normal practice for the Service trials of the Royal Navy's strike/fighter aircraft to be undertaken by separate units. The intensive flying trials were flown by the Naval Flight at A. and A.E.E., Boscombe Down, or a unit specially formed for the purpose; the tactical trials by the Naval Air Fighter Development Unit, and the technical evaluation by the Naval Air Maintenance Development Unit. But in April, 1955, the Director of Naval Air Warfare decided that all the trials for the Scimitar should be undertaken by one unit, which led to the establishment of No. 700 X Flight.

Commanded by Commander T. G. Innes, A.F.C., R.N., until his untimely death in a car accident near Arundel on March 21, and now under Lieut. Cdr. W. A. Tofts, R.N., the Flight is composed of eight pilots and will eventually consist of seven aircraft, six having been received to date. The pilots represent a fair cross-section of age, seniority and experience and include two Lieutenant Commanders, one as Senior Pilot and Trials Officer and the other, an air weapons instructor, as Weapons Trials Officer.

Resident with the Flight is an air engineer officer and an air electrical officer of the special maintenance party, an instructor officer for calculating the aircraft's performance data, and a second engineering officer for writing the weekly trials report. An extra pilot is also attached to the Flight for the development of the Scimitar simulators and cockpit procedure trainers. The rating complement is proportional to that of a "new-type" operational squadron with certain additions for the trials task, and in all its total strength is 16 officers, 46 chief petty officers and petty officers, and 72 junior ratings.

Stemming from the Supermarine Type 505, a high-performance undercarriageless design employing a landing "carpet" and a take-off accelerator, the Scimitar has already had a long political, financial and development history, and its background was described in THE AEROPLANE of July 26, 1957. Powered by two Rolls-Royce 200-series Avons, it is the Navy's first potential nuclear-weapon carrier capable of operating as a strategical strike aircraft.

Primarily a replacement for the day fighter/ground attack Sea Hawk, it has a long range for a single-seat aircraft, which can be increased by flight refuelling, and new navigation aids. In addition to a good climb performance the Scimitar has sufficient endurance for standing air patrols, an unusual feature for modern high-speed jet fighters, and for the limited-war rôle it can carry a large number of conventional weapons. These include its standard armament of four 40-mm. Aden guns, four 1,000-lb. bombs and an unspecified number of modified 60-lb. air-to-ground rockets.

As the first of its class for carrier operations the Scimitar has a number of features which are new to the Fleet Air Arm, and although it is not the ultimate in weapon developments it gives the Royal Navy a new potential in range and striking power. Among the new developments there are several items of ground and carrier equipment as well as actual aircraft components.

One of the most important flying developments that the Scimitar will introduce to operational carriers for the first time is the "blown" flap system for improving the low-speed performance of high-speed aircraft. Used for both landing-on

Left, the Avons of a Scimitar being started up for ground running with the aid of a Blackburn Palouste low-pressure air-starting trolley. Members of the ground crew are wearing the new-type glycerine-filled ear muffs and one rating can talk to the pilot through the intercom. "wander" line plugged into the starboard side of the fuselage behind the air intake.

Right, Curran detuners fitted to a Scimitar for engine ground tests to reduce the noise of the two Rolls-Royce 200-series Avons.

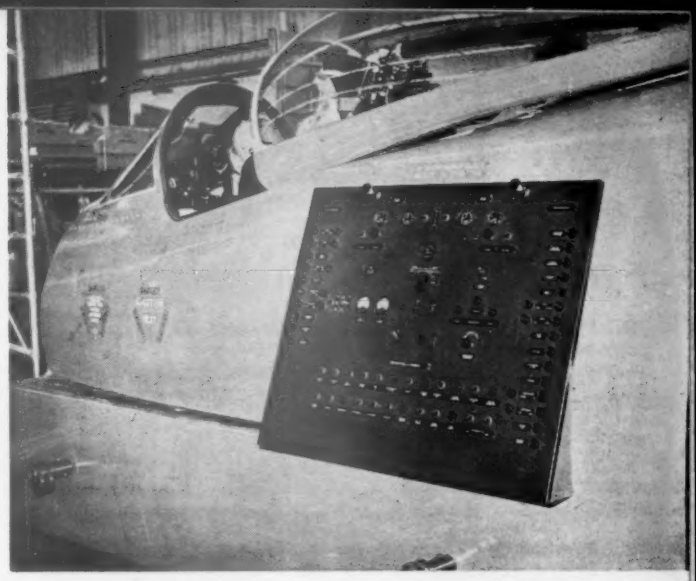
and catapult take-offs, the blown flap system—or "super-circulation," as it is also known—reduces the Scimitar approach speed by approximately 10 to 12%.

Using blown flaps for normal airfield flying the Scimitar has a shorter take-off run than other F.A.A. jet aircraft and a number of "free" carrier take-offs using the system were made with the Scimitar during its deck-landing trials on H.M.S. "Ark Royal." Photographs of these trials appeared in THE AEROPLANE of August 2, 1957.

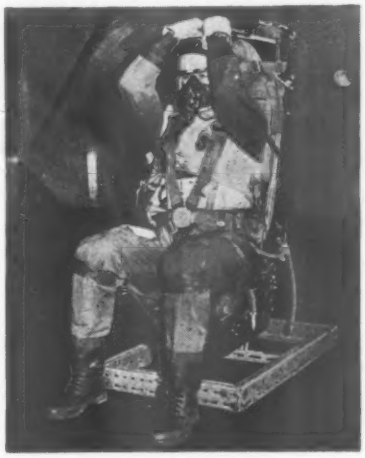
The Scimitar is well liked by the pilots of No. 700 X Flight and is reported to have extremely good low-level flying characteristics, which, coupled with very positive control, produce a stable weapons-firing platform. The Fairey hydraulic flying-control system is employed on all control surfaces, with Hobson artificial "feel" on the rudder and "all-flying" tail controls.

There are two completely separate two-pump hydraulic systems working at 4,000 p.s.i., with one pair of pumps on each powerplant. If a pilot loses one complete system (there is no manual standby system) the sortie is abandoned and he returns to base.

Another "first" for the Scimitar is the radar-ranging gyro gun sight (G.G.S.). Based on the standard fighter G.G.S., the ranging system incorporates the normal throttle twist-grip control for standby use. A novel feature is made by two red



The Scimitar procedure trainer manufactured by F. G. Miles, Ltd., for instructing pilots in cockpit checks and emergency drills prior to their first solo on type. A complete flight simulator by Air Trainers Link, Ltd., is expected to be delivered to the Service in the early summer.



A member of No. 700 X Flight, wearing the new one-piece immersion suit with the zip-up front and TALBE strapped round his waist, sitting on the Martin-Baker Mk. 4C ejection seat for the Scimitar. This has a single seat- and parachute - harness release box.

blinking "attention-getter" warning lights on each side of the cockpit coaming, which operate in the event of a major system failure. All failure indicators are grouped on the starboard console and cover the generator, hydraulic, oxygen and cabin-pressure systems; fire warning, and wing joint unlocking.

The ejection seat in the Scimitar is the Martin-Baker Mk. 4C which has a Duplex drogue; single combined parachute-and-seat-harness release box; cartridge-actuated hood jettison mechanism, and an 80 ft./sec. ejection gun. Safety equipment being worn by members of the Flight includes a new one-piece immersion suit with a zip-up front, as opposed to the standard two-piece suit in general service, g-suit, and TALBE. This last item, Talk and Listen Beacon Equipment, is the Fleet Air Arm's version of SARAH, which is tuned to the international emergency R/T frequency of 121.5 mc/s.

With the object of removing electrics from aircraft-starting systems without the use of cartridges, and to get electric trolleys off the flight deck, the Navy has introduced low-pressure air starting for the Scimitar. The ground unit used at Ford for this method is the Blackburn Palouste starter producing 30 p.s.i. at a temperature of 200° C. Manufactured in two versions, the Mk. 2 trolley for airfield use and the Mk. 1 pod for carrier starting which can be carried by a Scimitar as an underwing store in place of a drop-tank, the Blackburn unit starts an Avon 200 series engine in 8 sec.; the double start for a Scimitar being completed in 20 sec. with a good ground crew.

To reduce the noise factor during test runs on the ground Curran detuners are employed with jet-pipe extensions to protect the tail skin and structure from noise damage. At present the Scimitar tail unit has to be checked with an electronic crack-detection unit for skin and secondary-structure noise damage every 150 flying hours. Noise is going to become an acute problem on carriers when the new class of aircraft become operational, and extensive muffling of the island, coupled with deck jet-blast deflectors, is becoming necessary. For the ground crews, new glycerine-filled ear muffs have been designed.

Of equal importance to the flying trials is the engineering evaluation of the Scimitar, which has involved a period of continuous high-intensity flying with a target of 300 hr. on one aircraft in six months. Such flying uncovers the majority of the defects and snags that come to light when a new aircraft goes into service so that they can be overcome before the aircraft goes to the operational squadrons.

To complete this task the maintenance crews on the Flight have been broadly divided into two watches, and maintenance is continuous over a 21-hr. period each day. By this method some really intensive flying has been achieved and, for example, one aircraft was flown on 44 sorties logging 35 hr. in nine consecutive flying days. Based on the "crew chief" system, each Scimitar has a chief petty officer crew chief and a four-man crew in each watch comprising a junior rating from the airframe, engine, radio and electrical trades.—P.R.R.

THE AEROPLANE
APR. 4, 1958

Flying in the Tu-104A Jet Transport

by Peter W. Brooks

THROUGH the courtesy of C.S.A.—Czechoslovakian Air Lines—I had the opportunity on March 18 of riding as a passenger in their Tu-104A OK-LDC on a local training flight from London Airport. This aircraft is one of three now being operated by C.S.A., the first of which was delivered to the airline last November.

The Tu-104A is a slightly improved version of the original Tu-104. It has a mixed-class interior layout with seats for 54 "tourist class" passengers in the rear main cabin (all but one row five-abreast) and seats for 16 "first-class" passengers, four-abreast, in the forward cabin.

Externally the Tu-104A appears to be practically identical with the Tu-104 first prototype (number CCCP-L5400) which I was shown over on the ground at London Airport just two years ago. There are apparently a number of minor detail differences between the two versions of the aircraft, but the main changes seem to be in the interior layout. It seems probable that the 104A also has a later mark of engine and that it operates at higher weights.

According to recent Russian releases, the engines in the Tu-104A are Mikulin-Zubets AM-3M axials of 19,200 lb. static thrust each. These engines are remarkable for their low operating speeds. Their maximum at take-off is reported to be only 4,700 r.p.m.—which compares with, for example, the 8,200 r.p.m. of the Rolls-Royce Avon in the Comet and Caravelle.

Entering the aircraft by the rear door, one is struck once again by the height of the aircraft above the ground. The rear door sill is, in fact, about 12 feet from the ground. Passing through the inward-hinging door, one enters a vestibule with a coat space on the right against the port side of the fuselage. Opposite is a large freight hold. The passenger cabin is entered by turning left through a door on which a large mirror is mounted.

The steward asked that the two rear seat rows be left empty —presumably because of centre of gravity limitations—and I accordingly sat at the port window in the third row from the rear. The seats in this two-and-three arrangement are about 17 inches wide, while the aisle width measures about 15 inches. The seat pitch is about 39 inches. The windows are circular ports about 18 inches in diameter and are in-pitch with the seats, except that the third row from the front and the rearmost row have no windows. The windows seem smaller than they are because they have dark "surrounds." They are also, I think, rather too high above the floor to be ideally placed from the passenger's point of view.

The seat backs are adjustable over a very wide angle (about 40 deg.) by means of a lever mounted in the right arm rest. The arm rest also contains a retractable ashtray. A reading light of ingenious design, but poorly engineered, is mounted in the back of each seat and can be adjusted by the passenger in the seat behind so as to project its beam at the required angle on to his lap. The main cabin lighting is by large flat oval glass bowls fixed along the centre line of the cabin ceiling. Above the seats on each side of the aircraft are net baggage racks, with their framework apparently of brass and of a design somewhat reminiscent of a Victorian railway carriage.

The brass-like material (which is presumably some sort of light alloy) is also used for massive cast capitals to mahogany pillars spaced between each window along the cabin walls. These presumably conceal the fuselage frames. The external fuselage diameter of the Tu-104 has been stated to be 138 inches (the same as the upper "bubble" of the Vanguard), but the effect of these massive fuselage frames and their pillar-like coverings is to reduce the effective internal cabin width to about 126 inches—2½ inches less than the Vanguard's 128.5 inches.

The seats have conventional lapstraps and there is a small "Fasten Lapstraps" and "No smoking" lighted sign on the forward bulkhead of the cabin. This was too small to be visible from where I sat and had, in any case, obviously been overlooked in performing the cockpit drills because it was left on for the greater part of the flight.

While we waited for the engines to start, I gained several further impressions of the interior: the quality of the trim and upholstery materials seemed to be good, if, to Western eyes, in over-sombre shades; the seats are of neat design, but look heavy; the arm rests between the seats in each seat unit can be folded down out of the way and a life-belt is stowed under each seat; emergency oxygen masks are untidily stowed, together with individual American-style meal tray-tables, in pockets in the back of each seat; each mask is connected to an oxygen supply point beside the window by a festooning length of untidy hose; and the carpeting material is not satisfactorily attached to the floor, so that it was rucked and half rolled-back in several places.

At the rear of the main cabin the passenger is well aware of the engines starting: a growing, if subdued, roar was very evident coming from some source close at hand. This compares unfavourably with the almost imperceptible engine starting in the Caravelle or Boeing 707—and even in the Comet or Viscount. Without delay, both engines were opened straight up to quite a high thrust and we moved off the stand, turning fairly sharply on the inner four-wheeled bogie.

While taxi-ing, the noise level where I was sitting seemed rather high, but there was creditably little vibration. The

sharply-swept wings (36° sweep at the quarter chord) are very apparent when looking outside. Indeed, the impression is of a rather inadequate wing surface to carry an aeroplane with a maximum take-off weight which is said to be 164,250 lb. The wing area is reported to be 1,825 sq. ft.—giving a take-off wing loading of 90 lb./sq. ft.—the span is 113 ft. and the aspect ratio 7.05—the latter figure being about the same as that of the three types of American jet transport. The wing is said to be 12 per cent. thick.

The wing flexed a good deal as we taxied, as it did also in flight, but the skin—with its outstandingly good external finish—showed commendably little sign of wrinkling as the structure deflected. Most conspicuous of all, from where I sat, were the great Fowler-type flaps in the extended position. They had been in this position when we entered the aircraft and they remained at this setting (of perhaps 30°) until after take-off.

The take-off is notable for a very high level of noise in the rear seats. This noise continued during the climb and while cruising. I judged the take-off noise in the rear seats to be high enough to genuinely alarm a first-flight passenger. The climb/cruise noise was enough to make it necessary to raise the voice when speaking to one's immediate neighbour. The take-off itself took 30 seconds from releasing the brakes to unstick and it was followed by a moderate rate of climb which carried us to cloud base at about 1,000 ft., then through the cloud layer and up to about 20,000 according to the altimeter on the front bulkhead of the cabin.

I was surprised to see that the undercarriage was not retracted for some time after take-off. When it did start to come up, it did so extremely slowly. The bogies ponderously rotated backwards and swung aft into the special nacelles at the trailing edge of the wing. Doors in these nacelles opened to admit the wheels and then closed again—showing a not very good fit. The complete retraction operation took about 45 seconds. When it was completed, the flaps in their turn retracted slowly into the wings and were very neatly housed, all visible residual gaps being narrow and tidy.

As soon as the climb was established clear of cloud, I left my seat and explored the aircraft. It was at once apparent that the noise level at the back is substantially higher than elsewhere. The front half of the "tourist" cabin seemed not too bad by current Western standards and further forward still, in the "first class" compartment, the silence was comparable to that in the forward fuselages of the three other types of jet transport in which I have flown—Caravelle, Boeing 707 and Comet.

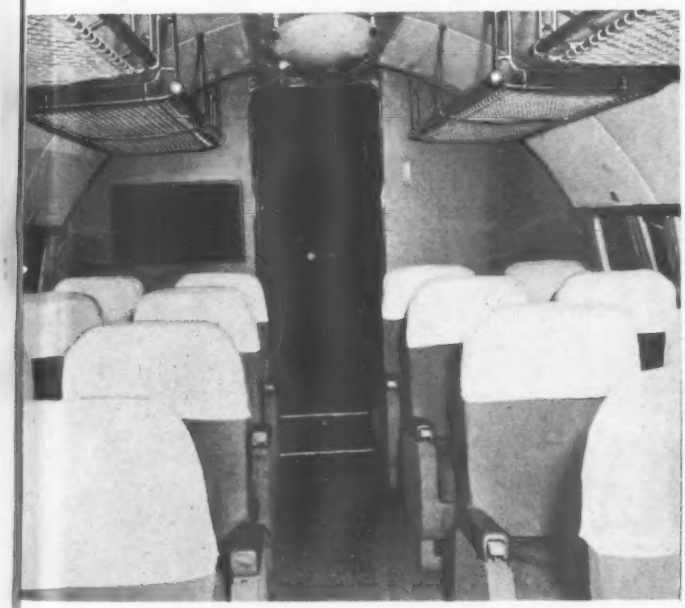
The "first-class" compartment is reached from the main cabin by way of the pantry, which is situated over the centre of the wing. The wing torsion box, passing through the fuselage, causes the floor of the pantry to be at a higher level than the floor-line of the fuselage. There is therefore a step up on entering the pantry at the forward and aft doors. The style of the pantry itself is reminiscent of the Victorian era. A massive sideboard-like structure is mounted along the port side with roof ports above it. On the other side of the aircraft more conventional-looking pantry units are lighted by two windows.

The seats in the forward "first class" compartment are arranged two-and-two on each side of a 22-inch aisle. The seats themselves are about 20 inches wide and are rather more comfortable than those in the "tourist" cabin. The pitch is about 45 inches. The pressure door at the forward end of the passenger space, which astonished Western observers when they first saw it on the Tu-104, is retained in the Tu-104A. The bulkhead holding this rearward-opening door is bowed forward so as to hold pressure in the passenger compartments in the event of pressure being lost in the "front end." It is not clear whether the bulkhead is also designed to provide protection against a converse failure.

I was allowed a brief visit to the flight deck after the aircraft had reached the top of its climb and while we were cruising peacefully in a perfectly clear sky with the North Sea occasionally visible through a few holes in the cloud far below. Mr. Kvacek, who is C.S.A.'s Technical Director, explained that the crew had its hands full on a training flight of this kind. They were not only learning the A.T.C. complexities of the approaches to London, but they were also handicapped by the language difficulty and by the need to convert units of distance, height and speed as they went along.

The aircraft was being flown by a training captain supervising a more junior captain, who spoke some English, but these two were largely dependent on a navigator who was acting as interpreter and who undertook the conversion of units as necessary. In the circumstances, one could understand that strangers were not particularly welcome on the flight deck and I did not tarry long. I did, however, gather that a cruising speed of rather more than 500 m.p.h. is achieved—which provides some confirmation of the claimed "high-speed cruise" of 531 m.p.h. The "maximum speed" is said to be 627 m.p.h.—which may imply that this is an E.A.S. limitation low down, or that the Mach Number "never-exceed" limit, high up, is 0.95. The full-tanks still-air range is said to be 2,800 statute miles and the capacity payload to be just under 20,000 lb.

The flight deck appeared to be closely similar to that of the Tu-104 first prototype and, in its layout and equipment, had a strongly military atmosphere. There seems good reason for



Above, inside the Tu-104A. This interior is the standard Aeroflot type; the C.S.A. layout is similar, with 54 tourist-style seats five-abreast in the rear cabin and 16 four-abreast seats in the forward cabin illustrated here.

Right, an Aeroflot Tu-104 at Prague showing the nose chin radar under it; astro compass just behind the cockpit; four VHF antennae above and below the fuselage cut to length suited to frequency; and radio altimeter "inverted-T" aerial under fuselage. The purpose of the semi-flush aerial over the entrance door is not known.

the theory that the front end of the Tu-104 derives directly from that of the Tu-16 medium bomber (N.A.T.O. code-name "Badger") which was, of course, the Tu-104's progenitor. Wings, tail unit, undercarriage and powerplants look as if they may have come straight off a Tu-16 production line. Many hundreds of Tu-16s have probably been built, so that this must greatly reduce the civil aircraft's prime cost as well as making a vital contribution towards reliability and long component lives.

Leaving the flight deck, and passing aft the length of the aircraft—accepting from the steward in transit a glass of excellent Czech beer—one reaches the extremely noisy accommodation beyond the entrance door in the rear end of the fuselage. A gentlemen's washroom and toilet to port, and the corresponding facilities for ladies to starboard, seem identical to those in the prototype. The hand basin in the gentlemen's washroom is quite a unique piece of aircraft furniture. A shallow "baby's bath," perhaps three feet long and a foot wide, it has no lipping of the edge or other precautions against turbulence, so that everything seems likely to get pretty wet if the basin is used in rough air.

A rather superficial search of the passenger accommodation revealed no sign of emergency exits, but inquiry of the crew elicited the information that there are two such exits in the "first class" compartment and four in the "tourist" cabin, in addition to one on the flight deck and one in the roof of the gentlemen's washroom. I was shown these exits and found that the operating levers were quite unmarked and were indeed deliberately concealed. My inquiries received the surprising reply that concealment of these exits is considered desirable because of the danger that they might be opened by an unauthorized individual. Apparently, the danger of accidental opening of an exit while the fuselage is under pressure is considered to be greater than that of the exits not being found by the passengers in an emergency.

Well-controlled Pressurization

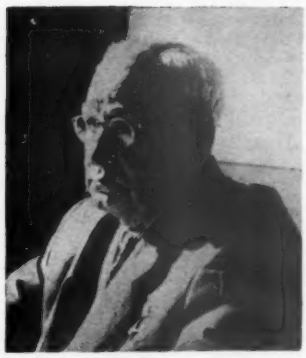
With regard to the pressurization, this was found to be impressively well controlled and free of surge. The designed maximum pressure differential is said to be 7.2 lb./sq. in., giving a cabin altitude of 8,000 feet at an operating height of 33,000 feet. The temperature control was also good, although the lack of individual punka louvres for the passengers became unpleasantly evident when a noticeable rise in cabin temperature occurred towards the end of the descent.

Before the let-down back to London Airport the engines were throttled back for a time and a drift-down was started. In the main passenger compartment the level of noise fell sharply, but there was a simultaneous, marked increase in vibration—presumably from some aerodynamic source, because the engines appeared to be quite smooth over their whole speed range on the ground. The Tu-104 is apparently not fitted with air brakes, so that a rapid descent in an emergency, of the type provided for in the operation of all Western jet transports, is presumably not possible. This may be one reason for the prominent emergency oxygen system to each passenger seat and the pressure bulkhead between the flight deck and the passenger accommodation.

We gradually let down towards London, entered cloud and finally broke into the clear at about 1,000 feet over Maidenhead. Shortly afterwards, presumably on the instructions of GCA, we completed a left-hand 360° turn, during which the undercarriage was lowered, taking almost as long to come down as it had done to retract. The flaps were still right up, but they were finally lowered in two stages during the final approach to the same setting as that used for take-off.

According to the junior captain—to whom I spoke after our return—the "approach speed" of the Tu-104 is 187 knots and the "landing speed" 144 knots. The language difficulty, plus lack of time, prevented proper clarification of these figures, but if we assume that by "landing speed" is meant "final approach speed," and that this is defined East of the Iron Curtain in the same way as it is in the West—that is as 30% more than the power-off stalling speed in the landing configuration—it would appear that the Tu-104A stalls at 111 knots.

The Tu-104A's wing loading, at a maximum landing weight of 141,000 lb., is about 77 lb./sq. ft., which compares with 66.4 for the Convair CV-880, 68.5 for the intercontinental Boeing 707-320 and 53.3 for the Comet 4. The stalling speed and wing loading quoted imply that the Tu-104A has an achieved maximum lift coefficient of 1.85, which seems not unreasonable for a swept-wing jet aircraft with Fowler-type flaps. The CV-880 (with double-slotted flaps, as fitted to all three American jet transports) is expected to achieve 1.83 and a stalling speed of 103 knots, the big Boeing (with the same type of flap) 1.81 and a stalling speed of 106 knots, and the Comet 4 (with plain flaps) a maximum lift coefficient of rather less than 1.8 and a stalling speed of about 95 knots.



Andrei Tupolev designer of the Tu-104.

It would appear likely, therefore, that the approach speed of the Tu-104A is, in fact, 144 knots, which is 11 knots more than the CV-880, six more than the big Boeing and about 20 more than the Comet 4.

Certainly, the landing on this occasion suggested "hot-rod" characteristics. An incipient swing after touchdown was checked by harsh braking, followed by further heavy and unpleasant use of the brakes so that we could turn off London Airport's 9,500 ft. Runway 10R at the half-way intersection for the return to the stand we had left in the Central Area 50 minutes before. It should be recorded, however, that the junior captain said afterwards that he liked the Tu-104 after flying it for 200 hours (out of his total of 6,000 hours). He also said that the aeroplane is popular with C.S.A.'s pilots.

In conclusion, it is interesting to consider the relationship which Russia's first jet transport bears to the corresponding aircraft of the Western World. The table on this page attempts to summarize the development stories of the significant types. It shows that the Russians have achieved a notable prestige victory by producing the Tu-104 as the World's first jet transport to go into airline service after the ill-fated Comet 1. Recent pronouncements behind the Iron Curtain suggest that the Russians themselves have some reservations about the economic characteristics of their first jet transport. However, the Tu-110, which is a slightly enlarged four-engined development, is on the way and this is likely to be a considerable improvement in this respect.

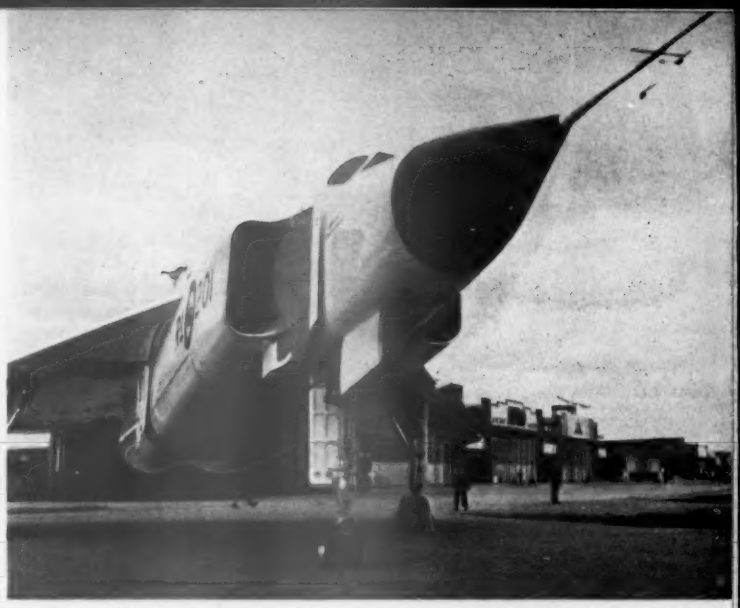
It will be interesting to see if the Russians follow up their jet transport pioneering with improved and larger jets, or whether they put the emphasis instead on turboprops of which they now have several extremely promising prototypes flying. The massive Tu-114, in particular, is claimed to offer almost jet speeds. If it can provide these at turboprop costs the Russians may yet follow up their prestige success with the Tu-104 with an even more significant material victory in the fiercely competitive field of commercial aircraft manufacture.

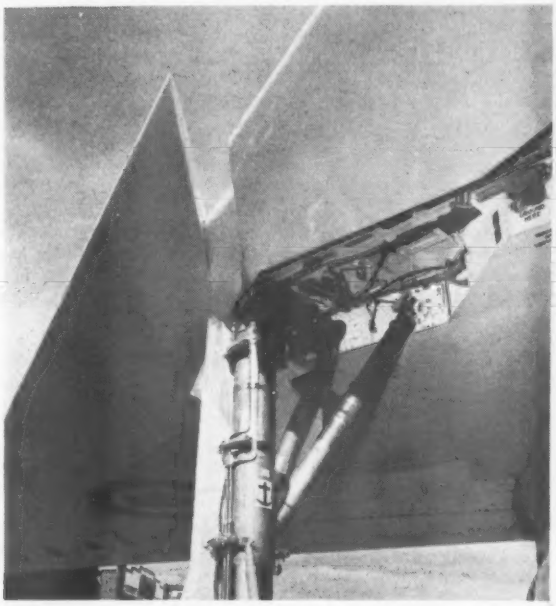
Jet Transport Development Time-Scales

Aircraft type	First discussions	First flight	First airline service
Comet 1	early 1946	27/7/49	2/5/52
Boeing 367-80	late 1951	15/7/54	-
Tu-104	1952?	early 1955	15/9/56
Tu-124A	1955?	mid 1957	late 1957
Tu-110	late 1955	mid 1957	?
Boeing 707-120	late 1954	20/12/57	Winter 1958
Comet 4	end 1954	Spring 1958	Spring 1959
Caravelle	mid 1951	27/5/55	mid 1959
Boeing 707-320	late 1955	late 1958	Autumn 1959
DC-8 (J-57)	mid 1955	Spring 1958	end 1959
DC-8 (J-75)	late 1955	late 1958	end 1959
Comet 4B	mid 1957	Summer 1959	Spring 1960
Boeing 720	late 1956	mid 1959	Spring 1960
CV-880	late 1955	early 1959	mid 1960
V.C.10	mid 1957	Autumn 1961	early 1964
D.H.121	mid 1957	Autumn 1961	Spring 1964

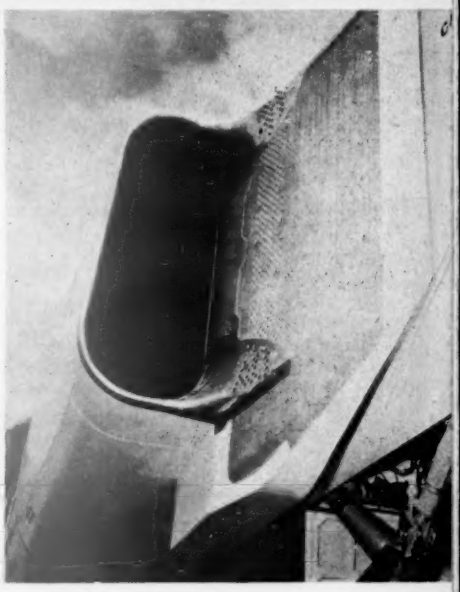
Canada's Arrow

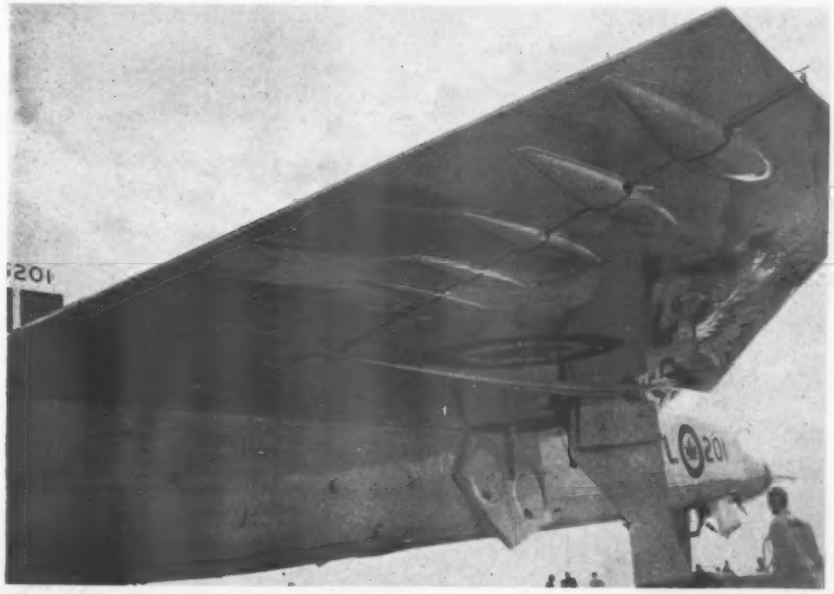
Some close-ups of the new Avro Aircraft supersonic all-weather fighter which made its first flight on March 25.





Above, the Arrow's fuselage is characterized by a "rectangular" cross-section to accommodate the side-by-side powerplants—which in the prototype are Pratt & Whitney J75s; production Arrows will have the Orenda Engines Iroquois turbojets. Left, the combined saw-tooth and "cut" in the leading-edge of the exceptionally thin 60° swept wing.





Above, boundary-layer bleed arrangements for the Arrow's supersonic air intakes; note the perforations for secondary boundary-layer bleed. Left, to house operating jacks for the control surfaces at the trailing edge of the 4% wing external fairings are necessary; note the thick, flat, trailing-edge which is intended to act as a form of vortex generator to prevent flow breakaway on the control surfaces.

Howard Levy photographs

High-speed Research at Brough

DEVELOPMENT of a high-speed naval strike aircraft, the N.A.39, is the greatest single task of Blackburn and General Aircraft, Ltd., at present and this work has brought the need for a high-speed wind-tunnel at Brough. The company has operated a low-speed tunnel for 20 years and until now has relied on the tunnels of the R.A.E. and the Aircraft Research Association at Bedford for high-speed testing.

Earl Mountbatten of Burma, the First Sea Lord, presses a button to start the new wind-tunnel. Beyond him, left, is Mr. Eric Turner, chairman and managing director of Blackburn and General Aircraft, Ltd.

Thus for N.A.39 development, and for work on future projects, Blackburns have designed and built a tunnel which can test aircraft and missile models over a Mach number range of 0.75 to 3.5; its working section is 27 in. square. Design and construction of the tunnel, which cost some £200,000, took only 18 months. It was officially opened on March 24 by Earl Mountbatten, the First Sea Lord.

The new Blackburn tunnel is of the intermittent running blow-down type. Air is compressed and stored in four reservoirs; it is then released and passes through the working section, giving the required airspeed round the model for a short time.

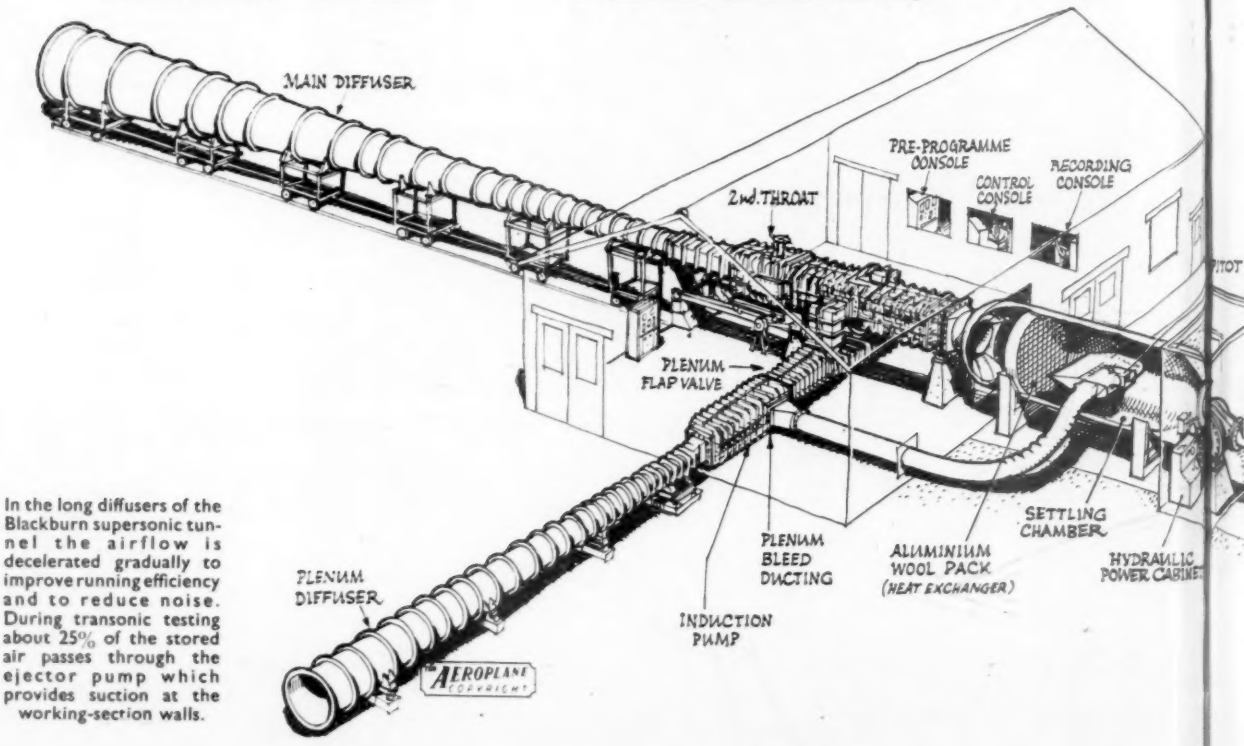
This type of tunnel enables very high operating speeds, Reynolds numbers and pressures to be achieved without vast power supplies. Against this can be set the limited running time and the need to recharge the reservoirs. But automatic data-recording techniques can be used to gain the maximum of information during short runs and in this way the drawbacks are minimized. On balance the intermittent type of tunnel is a logical choice; the costs of building and operating such a unit are a small fraction of those for a constant-running tunnel with the same working-section size and speed range.

Running times of the Blackburn tunnel for a series of Mach numbers are: 28 sec. running time for a Mach number of 0.75; 20 sec. for 1.0; 27 sec. for 1.5; 35 sec. for 2.0; 40 sec. for 2.5; 42 sec. for 3.0; and 45 sec. for 3.5.

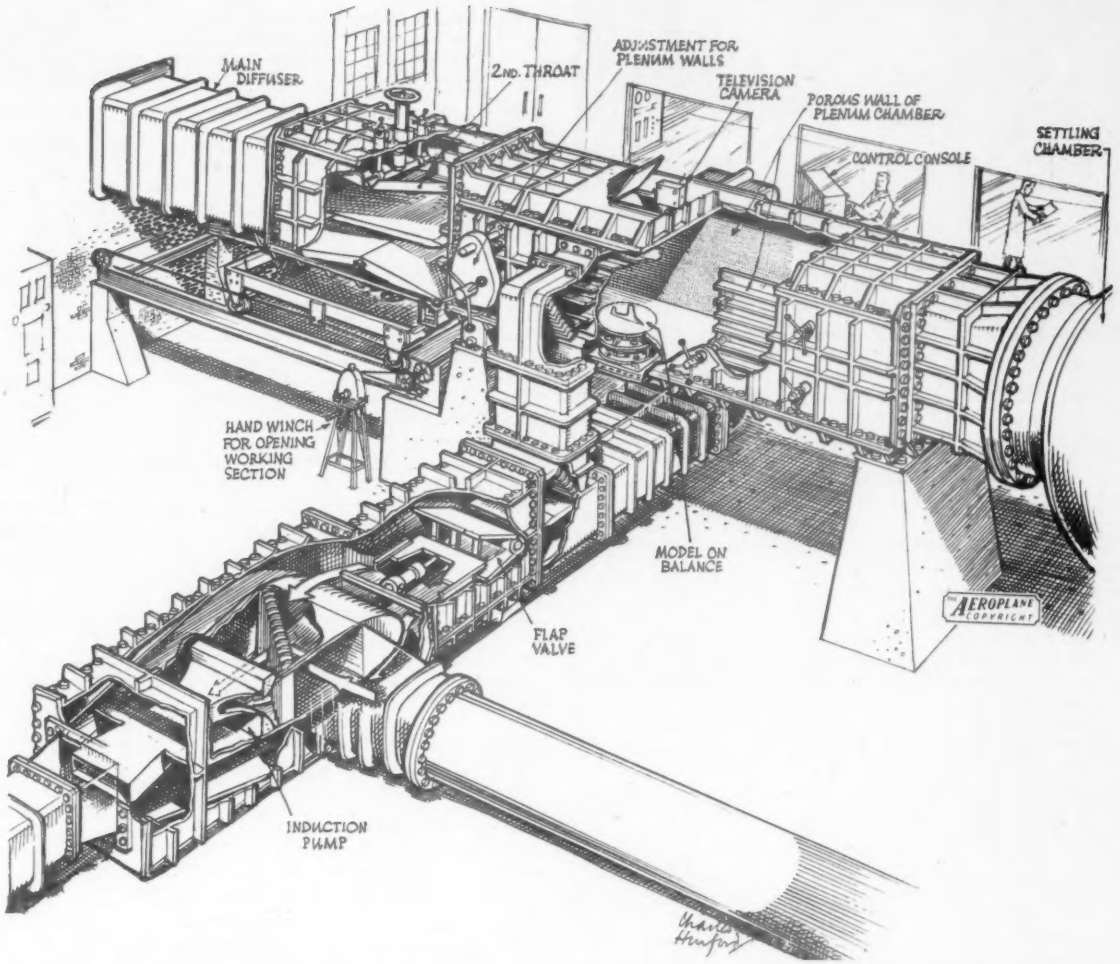
A feature of this new Blackburn tunnel is its operation through the transonic Mach-number range, when suction is applied through perforated walls in the working section. This suction is not provided by separate pumps, as is usually the case, but by an ejector pump which operates on compressed air ducted from the main air supply.

Compressed-air Supply

Standard air compressors supply air for the tunnel; compression is in three stages, with intercoolers between each stage. Electric motors drive the compressors and it takes four hours to fill the storage tanks with air at the maximum pressure of 450 p.s.i.; motor power used is 250 h.p.

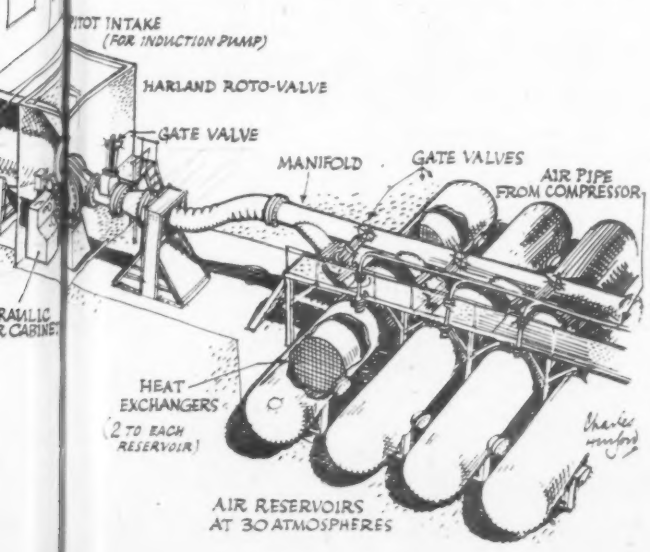


In the long diffusers of the Blackburn supersonic tunnel the airflow is decelerated gradually to improve running efficiency and to reduce noise. During transonic testing about 25% of the stored air passes through the ejector pump which provides suction at the working-section walls.



Between the compressors and the reservoirs the air is dried and precautions are taken to ensure that it is not contaminated with oil. The four high-pressure storage tanks are each 50 ft. long and 6 ft. 6 in. in diameter. They store more than 6,000 cu. ft. of air; this weighs about six tons at the maximum working pressure of 450 p.s.i.

Each tank holds two 4-ft.-thick banks of aluminium wool, which act as a store of heat at atmospheric temperature. This aluminium wool was installed as a result of experiments in Blackburn laboratories during the design of the tunnel. While the tunnel is running, the air in the tanks expands and cools; the extent of this cooling is limited by the aluminium wool which gives up some of its heat to the air. Without this heat store the temperature of the air would fall as low as −100° C. towards the end of a tunnel run and the test Reynolds number would vary greatly. In practice the temperature falls only to 10° C., as heat is absorbed from the aluminium wool, and working-section temperature is stabilized to within 10° C.



Compressed air from the reservoirs passes via a 2-ft.-diameter manifold and a supply pipe to a gate valve. Downstream of this is a special valve, a Harland Roto-valve, which controls the supply of air to the working section.

During tunnel runs the air supply from the reservoirs to the working section must be regulated to give a constant-speed airflow over the model under test. This is done by throttling the air as it passes through the control valve. Working conditions for this valve are exacting; it must open rapidly to give the required running conditions quickly and must progressively open further to maintain these conditions as the supply pressure decreases. This valve is controlled by pressure-sensing equipment in the settling chamber. The aim is to maintain a constant pressure in the settling chamber upstream of the working section. Trials with the tunnel have shown this can be done so well that the working-section airspeed varies by only ±0.01 in Mach number during a run.

Pressure measurements are transduced into electrical signals. These are amplified both electrically and hydraulically to operate the control valve. This control system was developed in the Blackburn laboratories; and special attention has been paid to the effect on stability of the time delay in the air moving between the control valve and the working section.

After running conditions and data-recording equipment have been set up, the operation of the tunnel is controlled by one man from a console. The airflow is started by a press button

This view of the working section shows the perforated walls for transonic testing, the window in the roof for observation of the model under test and the turbulence screen through which the air passes before entering the working section.

and the model can be rotated through a programmed range of incidence and data recorded automatically. The tunnel shuts down when pressure in the storage tanks falls to a preset minimum and the model returns to its initial incidence. Instruments show running conditions and, in an emergency, the operator can close the main throttle valve.

Settling Chamber and Working Section

After passing through the control valve the compressed air enters a settling chamber, which is 32 ft. 6 in. long and 8 ft. in diameter. It is sturdily built and stressed to take a 450-p.s.i. internal pressure. Spanning the chamber is an aerofoil-section fairing which has a pitot intake in its leading edge. Air which enters this intake is led to the induction pump to provide working-section suction when tests are being made in the transonic range.

Downstream of this intake is a honeycomb for smoothing the air flow; it is filled with a 6-in. layer of aluminium wool which acts as a final heat-exchange medium for the air before it enters the working section. Airflow is finally smoothed by a turbulence screen downstream of the aluminium wool.

At the end of the settling chamber the air passes through a nozzle and enters the working section, which is 27 in. square. In effect, it is a heavily reinforced steel box which is designed to carry the maximum storage pressure although the static pressure in it during a run is only half an atmosphere or less.

The working section can be removed for the fitting of convergent-divergent nozzles for supersonic running. For tests in the Mach number range from 0.90 to 1.3, perforated walls are fitted in the working section and air is sucked through them. This technique avoids the blockage problems which used to make tunnel tests virtually impossible at transonic speeds.

These perforated walls have ¾-in. holes drilled on a 1-in. square grid. About 10% of the air entering the working section leaves through these holes; the actual quantity is used to regulate the Mach number. The position of the perforated tunnel walls can be altered by means of screw jacks.

Considerable pumping power is needed to suck air through the tunnel walls where, during transonic tests, pressure is about half an atmosphere and to eject it at atmospheric pressure. Mechanical pumps would have been excessively large and expensive and therefore an ejector pump was designed. It has a Mach 2 two-dimensional nozzle.

As mentioned earlier, air for this pump is ducted from an intake in the settling chamber; about 25% of the total stored air is used and this, together with the air sucked through the working-section walls, is exhausted through a separate diffuser. The degree of suction applied to the tunnel walls is controlled by a flap valve in the ducting between the tunnel walls and the ejector pump.

Downstream of the working section the air passes through an adjustable throat and enters the diffuser. Both these sections are built of reinforced steel and mounted on trolleys which move along rails. This enables them to be drawn clear of the working section when it is being removed; it also allows for expansion of the tunnel. The only longitudinal anchoring point for the tunnel and diffusers is at the main control valve.

A long diffuser is used, as the air must be diffused with the minimum of loss to improve running efficiency and to reduce noise. This is very important, since the equivalent power during running is some 50,000 h.p.

All standard types of testing can be carried out in the tunnel and appropriate instrumentation is provided. Force and moment measurements can be made on both complete and half models, their greatest spanwise dimension in each case being about 10 in. The balance for half models is in the tunnel floor—it can be rotated to vary model incidence. A four-component strain-gauge balance has been developed by Blackburns for N.A.39 testing; it measures lift, drag, rolling moment and pitching moment.

All information during a tunnel run is pen recorded; the model is rotated automatically, so that tests can be made at different incidence angles during one run. Model incidence can be changed once per second by one-, two- or three-degree steps.

Complete models are sting mounted from the splitter plate in the throat downstream of the working section. The sting has an integral six-component strain-gauge balance.

Most measurements are transduced into electric signals; these are recorded on Honeywell-Brown pen recorders which have a quarter-second response time for full-scale deflection. Pressure-plotting records, however, can be made by direct photography of banks of manometers.

Shadowgraph studies of shock-wave patterns can be made both by television and by direct photography. Closed-circuit television enables the tunnel operator to watch the model under test. The camera is mounted in the roof of the working section over a 12-in. x 18-in. optically flat window.

Methods of rapid data processing have been installed so that the tunnel can give results quickly in the form designers need them. Special equipment is used to analyse traces from the pen recorders. When cross wires are set on the trace this equipment will scale, calibrate and write the appropriate number. Records can be made simultaneously by an electric typewriter and on a punched paper tape; in this form they can be analysed on the Ferranti Pegasus electronic digital computer now being installed at Brough.

Model Making

Construction of models for high-speed tunnels is a big task. They must be of solid steel and accurate to within 0.001 inch. A good deal of thought has been given to their production at Blackburns and a tangent-planing technique applied. With the use of programmed machining and special fixture techniques, model-making time is considerably reduced. For the rapid production of models to investigate design changes a precision-casting technique has been studied.

Attached to the tunnel is a precision model shop, equipped with new machine tools. It is interesting to record that model-making facilities made up some 30% of the total cost of the tunnel.

Blackburns have said that their new tunnel is suitable for testing missiles as well as aircraft. Initially, however, model tests will be concentrated in the transonic range on N.A.39 development. A technique which will be applied to the N.A.39 is flutter-model testing to destruction. A tunnel of this type lends itself to these tests as it does not have a fan downstream of the working section which might be damaged when a model disintegrates.

Aerodynamic design and co-ordination of tunnel construction were carried out by the Blackburn aerodynamics laboratory. A great deal of the construction work was, of course, sub-contracted and among the many companies concerned were the following:—

Aiton and Co., Ltd., pipe work and gate valves; Birlec Ltd., air dryers; Black Automatic Controls Ltd., pressure switches; British Steel Wool Co., Ltd., aluminium wool; Peter Brotherhood, pumps and coolers; Cambridge Instrument Co., Ltd., temperature indicators; F. Hall and Son, Ltd., building; Harland Engineering Co., Ltd., main control valve; G. A. Harvey and Co. (London), Ltd., honeycomb grids and wire mesh for heat exchanger; Honeywell and Brown, Ltd., electronic pen recorders; Humber Electrical Eng. Co., Ltd., electrical installations; Robert Jenkins (Rotherham), storage tanks and settling chamber; Lightowler and Son, Ltd., decorations; Lockheed Hydraulics Ltd., hydraulic equipment; Moog Valve Co. Inc. (U.S.A.), hydraulic flow control; Patchett and Co., Ltd. (Leeds), diffusers and carriages; Pye Ltd., closed-loop TV; Record Electrical Co., Ltd., Cirscale instruments and special relays; Statham Laboratories Inc. (U.S.A.), pressure transducers; Woodside Die Sinking Co., working section.

Flying the Piaggio Amphibian

by John Fricker

SINCE the War, flying-boats and seaplanes have almost disappeared in England, probably because of the multiplicity of airfields which became available after 1945 and the general decline in the light-aircraft field, but the recent tour of the Piaggio P.136 amphibian provided a stimulating reminder of the possibilities offered by these aircraft. Having savoured the delights, for the first time as a pilot, of splashing around the Thames and the Medway, I am a ready convert to the cause of water flying, and I am convinced that there are many useful jobs around the British Isles awaiting the arrival of a small amphibian for their economical execution.

Apart from its amphibious qualities, the Piaggio P.136 has another very strong advantage for the prospective charter or executive operator in being a relatively high-performance twin of the optimum five-seat capacity, but available for sterling instead of dollars. It is regrettable that an extremely strong case must be put to the Board of Trade before an import licence and the necessary dollar allowance are granted to purchase one of the very desirable American light aircraft, but the Piaggio does offer a much easier alternative, and at an approximate price of £21,000, ex-Genoa, represents extraordinarily good value.

Much of its success, in fact, has been gained in the United States, where the P.136 is marketed by the Trecker Aircraft Corporation as the Royal Gull. The bare airframes are manufactured in the Piaggio factory at Finale Ligure, on the Italian Riviera, and are shipped to the U.S., where they are fitted by the Trecker company with engines, propellers and instruments. The original Royal Gull, the Piaggio P.136-L1, which was the second production series in Italy, is powered by two 270-b.h.p. Lycoming GO-480-B1B engines, but the latest series, the P.136-L2, or Super 200 Gull, has supercharged 320-h.p. GSO-480 engines.

The P.136-L2 also has an additional dorsal fin to meet the asymmetric case with increased power, and this extension will also be fitted to current production L1s, to improve directional stability. The P.136-L2 has a considerable power increase compared with the prototype of 10 years ago. The prototype originally went into production with two 215-b.h.p. Franklin engines for the Aeronautica Militare for air/sea rescue duties, and has provided a substantial development background for the civil Gulls. In all, about 85 P.136s have so far been built by Piaggio, of which slightly more than half have been sold in the U.S., and one or two to European customers.

One of the most regular of Piaggio's clients is Mr. Aristotle Onassis, the shipping magnate, who is about to receive his third P.136, an L2. With Signor Bruno Mori, technical manager of the Piaggio company, and an engineer, Mr. Onassis' personal pilot, Signor Ugo Pierotti, flew the visiting P.136 on its tour.

The aircraft, appropriately registered I-GULL, was a not-quite-standard P.136-L1, being a former Italian Air Force machine and therefore lacking one or two refinements, while retaining air/sea rescue-type doors. The most important omission, in the icy Ides of March, was a cabin heater, which, like anti-icing equipment and radio, is not included in the basic price, but the demonstrator had both 12-channel VHF and a Lear radio compass.

Instrument layout was also not quite standard, but was entirely straightforward. Engine instruments are mounted between the two pilots' panels, with throttle, pitch, undercarriage and flap levers on a small console between the adjustable front seats. Full dual control was provided in I-GULL, and included plate-type toe brakes and close-set rudder pedals.

Altogether, a workmanlike cockpit, in keeping with the rest of the design, which is sturdy (with an ultimate load factor of 6.6) without appearing to incur the excessive weight penalty of most amphibious designs. The airframe is all-metal, of a very high standard of workmanship, with fabric-covered control surfaces, and its gull-winged layout keeps the propellers clear of water spray. The unusual pusher powerplant arrangement also helps in that respect, besides reducing the cabin noise level and permitting a superbly unobstructed view.

The "Italian" P.136s have Piaggio-built Lycoming engines and three-bladed propellers with corrosion-free stainless-steel leading-edge strips, designed and built by the same company, while the Trecker Gulls have Hartzell propellers. Both types of airscrew are hydraulically actuated constant-speed units,

Photographs copyright "The Aeroplane"

On land, water, or in the air, the Piaggio P.136 performs equally well, and combines utility and eye appeal with excellent handling qualities. On the right, the little amphibian is alighting on the Medway.

Except possibly for the elevator trim wheel, on the right of the throttle console, the controls of the P.136 are well laid out and come conveniently to hand. On the port wall are the fuel cocks.

but only on the P.136-L2, are they feathering, having a maximum coarse-pitch position of 40° on the earlier series. The P.136 is an "all-hydraulic" aeroplane, this power being employed for undercarriage operation (including rotation of the tailwheel), flap and brake actuation, and for tailwheel locking.

Undercarriage retraction is round a simple hinge, so that the main wheels are housed edge-on in deep hull recesses, behind which are the fuel-tank and baggage compartments. Normal usable fuel capacity of the P.136 is 158 Imp. gal. in two tanks, side-by-side in the centre fuselage, with full cross-feed arrangements, and a very large hatch on the port side of the hull gives access both to these and to the capacious rear baggage hold. The hold has a maximum capacity of 300 lb., and there is a smaller compartment, for 170 lb. of hand baggage, behind the rear bench seat in the cabin.

Entry into the P.136 is a matter of ease and dignity, through the large doors on each side of the cabin, and via the chine spray-deflector plate, which also serves as a convenient step. There is ample room on the bench seat for three passengers, but the pilots' seats are set rather too close together for absolute comfort. An intriguing, and essential feature of the cabin, for nautical operations, is the opening starboard windscreen, which is hinged at the centre frame and gives access, when waterborne, to a bow compartment containing a jolly little anchor. Forward of this hatch is a mooring bollard, while on the starboard side of the cabin floor, in a recess beneath the carpet, is a full-sized boathook. A retractable bilge pump is stowed alongside, ready to be connected to any of an adjacent group of six tubes leading from the watertight compartments in the hull.

Fortunately none of this impedimenta was required during our excursions on the river, which started off in the wilds of Wapping under the most congested conditions imaginable. After some circuits at about 200 ft. over the Thames east of Tower Bridge we found a narrow stretch of river more or less into wind. Pierotti alighted (note the nautical terminology), having popped out some flap at the last moment, and we found ourselves waterborne in a remarkably short time.

This abrupt transition from flight to float was very different from the long drawn-out and involved process which, in my complete ignorance of such operations, I had imagined. For "taxi-ing" a water rudder is extended from the rear of the hull by means of a roof handle, which then dangles on a long piece of wire as a position indicator. When extended the water rudder is automatically linked with the rudder pedals for simple and effective steering.

After watching a few take-offs and landings as a passenger I climbed into the left-hand seat to undergo my nautical baptism. Pre-take-off checks are similar in most respects for land or water operation, and include neutral rudder trim, about four divisions of elevator trim, 15° or 20° of flap, and water rudder retracted. Rudder trim is via a crank in the roof, while the elevator trim wheel is slightly awkwardly situated on the starboard side of the throttle console.

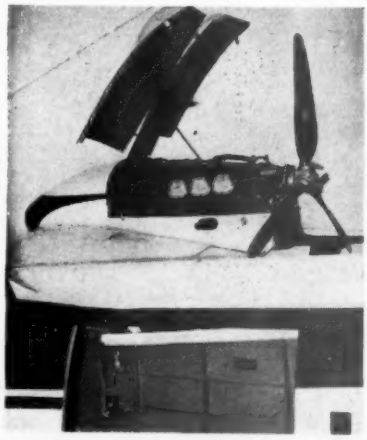
From a very rapid briefing on the appropriate flying techniques I gathered that the P.136 presented no especial problems on the water, and that the best thing to do was to follow normal land procedures for most of the time. On opening the throttles for take-off I noticed that, initially, fairly coarse rudder and aileron was required to keep straight, and then the aircraft could be assisted on to the step by slight aft movement of the control wheel. Forward pressure was then required to continue accelerating in a level attitude, until at about 75 knots, after smacking a few times into the slight swell, the firm use of a little aft elevator gave a clean unstick.

At take-off power of about 28-in. Hg. and 3,400 r.p.m., the P.136 climbed away briskly at 100 knots after a run of about 14 sec.; when held on the water until the take-off safety speed (1.2 Vs) of about 85 m.p.h. is achieved, the run should never exceed 18 sec. at the maximum gross weight of 5,996 lb.

Indicated climb, when throttled back to 26-in. Hg. and 3,000 r.p.m., with four occupants on board, was about 800-1,000 ft./min., and easing up the slotted flaps resulted in very little sink or change of trim. In the air, the P.136 handled very well indeed, the light and effective ailerons being nicely harmonized with elevators and rudder; and control is almost suprisingly exuberant for a small flying-boat without being in any way over-sensitive.

Trim changes are small at all times, and the first stage of flap can be lowered below 109 knots with a little aft compensation when downwind. Normal approach speed, with a little power, is about 100 knots, but when full flap is extended, on finals, an extraordinarily steep angle of descent is required to maintain about 90 knots I.A.S. Ample elevator power remains for the round-out, however, and the landing technique appears to follow the normal three-point procedure. Initial contact with the water at 70-75 knots is harder than on any airfield, and in choppy conditions the Medway later felt like a ploughed field with frozen ruts. The P.136 skipped a few times before settling down, but once off the step deceleration was rapid, accompanied by a substantial bow wave over the cabin, which demonstrated an admirable watertightness. The P.136 can be operated from quite rough water, and is cleared for a wave height of 2 ft. (Beaufort scale No. 2), with a cross-wind limit of 14 knots.

Back at Croydon, where the Piaggio P.136 was based during its stay, and which was reached at the low-altitude cruising speed of 140 knots I.A.S., with a power-setting of 25-in. Hg and 2,800 r.p.m., I was able to complete a most enjoyable handling session by exploring the landplane characteristics. When taxiing on the airfield, I found that the hydraulic toe brakes did not seem particularly effective, and a little care was needed to keep straight with the tailwheel unlocked. With this engaged for take-off, however, there was no tendency to swing, and the P.136 needed little assistance to fly itself off after a commendably short run.



This view of the P.136 centre-section shows the petal-type cowlings, giving ready access to the Lycoming engines, the Piaggio propeller, and the capacious rear baggage compartment.

Photographs Copyright "The Aeroplane"

The undercarriage lever at the bottom of the throttle console is best located by feel, and the wheels come up with virtually no change of trim. Three red lights on the instrument panel remain on when the wheels are retracted, and there are also mechanical position indicators running along the bottom of the starboard instrument panel.

Safety speed for single-engine climb-out is 88 m.p.h. and V_{MCA} is 77 m.p.h. In the circuit at Croydon I tried some asymmetric flying, with the port engine throttled back and the propeller in the maximum coarse pitch position, and found that the foot load with the other engine at maximum continuous power could be comfortably held until trimmed out. At about 90 knots I.A.S., the P.136 then climbed steadily at about 250 ft./min., and this, of course, could be increased if required by opening up the operative engine to take-off power.

So far as low-speed performance is concerned, the P.136 conforms and is licensed to C.A.A. requirements, as are all its

structural and performance aspects, and the stalls in all configurations are innocuous. Like most clean modern aircraft, the P.136 offers not a great deal of aerodynamic stall warning, although there is an unusual high-frequency vibration a few knots before the break-away. This occurs at about 75 knots I.A.S., clean and without power, followed by a straight nose drop and a reasonable loss of height. With 15° of flap and a trickle of power, the stall occurs fairly abruptly at about 65 knots, accompanied by a starboard wing-drop.

Perhaps the only slightly adverse feature of the P.136 in the air, which has already been taken care of in all current and future production aircraft by the additional fin area, is an apparent tendency towards directional instability. This is evidenced by slight difficulty in keeping the ball of the turn-and-slip indicator central under certain conditions, and by a lack of positive rudder trim. The elevator trim wheel is too low-geared and has rather a lot of backlash for precise and rapid longitudinal trim, but this is fortunately seldom required. Even in the most difficult case of over-shooting with full power from the approach configuration, the P.136 has no large change of trim, and control forces remain pleasantly light throughout the normal operating speeds. Never-exceed speed is 194 knots.

Downwind in the circuit, speed must be reduced to 109 knots for the extension of both undercarriage and flaps. As in the water-alightings, the approach angle becomes very steep when the full 45° of flap are extended, but the change of attitude for landing is not so pronounced as might be imagined, and the elevators are powerful enough to result in a tailwheel-first touch-down. Landing the P.136 is very easy, however, and smooth three-pointers can be achieved with little effort, assisted by the pleasantly "squashy" undercarriage.

Two trips in the P.136 convinced me that small amphibians are even more delightful than "messing about in boats," and that its versatility is not gained at the expense of an excessive weight or performance penalty.

Technical Data

DIMENSIONS.—Span, 44 ft. 4½ in.; length, 35 ft. 5¼ in.; height, 12 ft. 6¼ in.; wing area (gross), 270.2 sq. ft.

WEIGHTS.—Empty, 4,460 lb.; fuel (158 Imp. gal.), 1,135 lb.; oil (6 gal.), 45 lb.; anchor, 20 lb.; pilot, passenger and baggage, 340 lb.; useful load, 1,540 lb.; max. gross, 6,000 lb.

PERFORMANCE.—Max. speed, sea level, 182 m.p.h.; cruising speed, 70% power, at 9,000 ft., 167 m.p.h.; cruising speed, 60% power at 9,000 ft., 153 m.p.h.; stalling speed, with flap, 68 m.p.h.; climb to 9,000 ft., 10¼ min.; range (pilot and four passengers), 715 miles; take-off run, to 50 ft., 1,378 ft.; landing run, from 50 ft., 1,410 ft.

GLIDING NOTES

SAILPLANES were not invented as a sure means of transport for pre-arranged journeys, although many of the general public seem to think this is the sole purpose for which they are designed, and are still waiting to see it achieved with 100% regularity. Nevertheless it sometimes happens, as on March 6, when Peter Scott was due to give a lecture at the Military College of Science at Shrivenham and decided to go there from the Bristol Club at Nympsfield in his Sea Eagle (T-42b). So he packed his evening clothes in the back seat, took off, covered the 28 air miles in 75 min., and arrived at 4,500 ft.—only to find that the wind was wrong for landing on the parade ground, so he had to nip over to the other side of the road.

* * *

Plotting the previous course of the air, one finds that it was off the east coast of Greenland two days before; it crossed Iceland during the night and Northern Ireland the next night, so that South Wales was the first land that it hit in the daytime. Its bottom layer was then warmed to such effect that to Peter Scott it looked like a Gold "C" distance day, and he could have gone a lot farther than he did. On the following Sunday, March 9, thermals at Nympsfield were again rising to 4,500 ft., to the joy of an R.A.F. party from the Wessex Club at Andover. They were just finishing a week's camp there, during which they put up 72 hours' soaring with three sailplanes.

This must have been the first time anyone has travelled by sailplane to give a lecture, though not the first time the feat has been attempted. Some 20 years ago Capt. R. S. Rattray, who lectured on West African languages at both Oxford and Cambridge and lived half-way between the two, put his notes and books aboard his Cambridge II and took a launch from Dunstable in a wind blowing towards Cambridge. But the thermals failed to boil up sufficiently and he had to land and go by road as usual.

* * *

There can be no doubt by now of the excellence of Nympsfield, just south-west of Stroud, as a source of thermals. The last cross-country of 1957 was as late as October 19, when Mr. Corrick took a Skylark 65 miles to Reading. But by February, 1958, thermals were already starting up again, and Peter Scott's cross-country is the earliest in the year ever made by a Bristol Club member.

Bristol Gliding Club has just produced an excellent "Official Handbook" giving a short history of the club and telling the reader what goes on there. Quoting the old saying that if man had been intended to fly he would have been provided with wings, it adds: "Well, a pair is waiting for *you* at Nympsfield; why not come along some time and try them on for size?"

ENCOURAGEMENT.—Mr. Nehru, India's Premier, is here seen in the cockpit of a sailplane before a flight over New Delhi, during which he handled the controls for several minutes.

SAINT AUBAN sur Durance, the famous wave-soaring centre in southern France, has been living up to its reputation for laying on its best waves early in the year. For instance, Walt H. Pratt writes, on a single day, February 20, diamonds for altitude, involving a climb of 5,000 m. (16,404 ft.), were earned by 13 pilots.

But it was in an unusual wind direction, S.S.W., not the northerly *mistral*, that Daniel Barbera set off from a wave at St. Auban on February 10 to cross the Alps to Innsbruck. He started at 12.03 hrs., and after 6 hr. had travelled 286 miles to Ellikon, near the Swiss shore of Lake Constance; but by then it was getting dark, so he landed at 18.10 hrs. Till then he had been maintaining altitudes of between 10,000 and 22,000 ft.

A climb to over 10,000 m., the first to be made in France, was achieved on February 24 by Michel Marchand, a young professional meteorologist, who reached 10,100 m. (33,136 ft.). He had released at 2,000 m. after a launch from Issoire, and connected with the wave 28 miles to the N.W. This beat Barbera's record of 31,700 ft. and an absolute altitude of 30,600 ft. reached by Mlle. Abadie on February 20, though it is not clear whether the latter was a national or only a feminine record.

* * *

As to French records for gain of altitude, Barbera climbed 26 300 ft. on February 6, though he had achieved 27,400 ft. with a non-registering barograph. Jules Landi then beat both these figures on February 20 with a climb of 29,600 ft., which is 550 ft. short of the World's record held by W. B. Ivans of the U.S.A., and 200 ft. more than S. H. Georgeson's recent climb in New Zealand. A two-seater French record for gain of height was set up on February 7 by Mlle. Abadie and Mme. Barbera, who climbed 21,300 ft. in a Breguet 904. This was the machine in which Mlle. Abadie reached 30,600 ft. flying solo. A feminine French record for single-seater gain of height, 26,600 ft., was put up by Mlle. Dupuy de Mery on February 22 with a Breguet 901.

A sad piece of news is that of the closing of the gliding centre at Pont St. Vincent, near Nancy, from which many notable long-distance flights across France have been made. Government economy is the reason, and 7 million francs will be saved.—A. E. SLATER.

PRIVATE FLYING

H.J.C.'s Club Commentary:

The End in Yorkshire?
A Display at Swansea
A Design from Poland

● IT COMES as somewhat of a shock to learn that the **Yorkshire Aeroplane Club,** one of the oldest flying clubs in Britain, was due to close down on Monday last, March 31—unless a last-minute solution could be found.

The co-directors of the club, Messrs. Ronald H. Braime and Arnold Wilson, have blamed ever-increasing costs, along with decrease in membership and staff difficulties, as the main cause for the decision to close.

One had always regarded the Yorkshire club, which rents Sherburn-in-Elmet aerodrome from the Air Ministry, as among the soundest, but present membership now stands at only 130. To try to keep it in operation a special committee has been formed to look into various means, one of which is consideration of an offer of help by Mr. L. S. Dawson, chairman of Yeadon Aviation, Ltd., which controls the Yeadon Aero Club, near Leeds. Another possibility is a move to the aerodrome at Clifton, which is controlled by the York City Council.

KENTISH CRUISE.—Seen at 2,500 ft. above the Cliffe marshes is Tiger Moth, G-ANLS, operated by the Rochester Flying Club and flown by an instructor, Mr. Vic Arnold. The picture was taken from the club's other Tiger, G-AOUI.

● FOUNDED as long ago as September, 1909, the Yorkshire Aeroplane Club began "the advancement of the science of aviation" with the holding of lectures and building of models, while a few members experimented with full-scale aeroplanes. One of the members was Mr. Robert Blackburn, who had flown his first aeroplane at Saltburn in the previous April.

As soon as possible after the First World War, when activities were inevitably curtailed, the club was re-established, and when the Air Ministry's plan for the promotion of flying clubs was instituted, began to assume activities of the type which became familiar in the flying club world. The official opening ceremony was performed at Sherburn by Sir Sefton Brancker, then Director of Civil Aviation, on January 10, 1926. Two D.H. Cirrus Moths formed the fleet, which were followed a year later by three Bluebirds.

In 1930 the Leeds and Bradford Corporations adopted Yeadon as a municipal airport, and the club moved there the next year. By the spring of 1939 nine instructors were on the strength, and the fleet consisted of 19 aeroplanes, including Tiger, Puss, Leopard and Hornet Moths and a Short Scion.

● DURING the Second World War Yeadon was requisitioned. It was not available when private flying was again allowed on January 1, 1946, so back the club went to Sherburn, occupying the A.T.A. premises.

One's sympathy is expressed with the many people who have worked hard to build up this club, and it is sincerely to be hoped that circumstances will allow it to be carried on.

● ONCE AGAIN this year an air display is to be held at Swansea Airport (Fairwood Common), and the date is to be June 7. The Tiger Club and the British Parachute Club are to provide the nucleus of the display, which is in aid of the British Empire Games Appeal. The Jackaroo and Turbulent are to be demonstrated, also, it is hoped, the Arrow Active, and ground attractions will include a barbecue, the finish of a road race, a gymnastics display, pony riding and dancing.

Swansea Corporation is providing free use of the aerodrome, and Cambrian Airways, managers of the airport, are co-operating. An invitation is extended to all flying clubs to visit the airport during the afternoon.

● THE secretary of the Private Aviation Section of the Royal Dutch Aero Club, Mr. J. van Hattum, writes that there is to be only one air camping rally in Holland this year, not two, as mentioned in our issue of March 14. It will be held at Twenthe from July 12 to 14.

A New Polish Trainer

WE made brief reference in our issue of March 14 to the M-2 trainer, which is being produced by the Transport Vehicle Manufacturing Centre (W.S.K.), a subsidiary of P.Z.L., at Mielec.

The M-2 is intended primarily for the aero clubs in Poland and is designed to be suitable for advanced aerobatic flying. It is an all-metal semi-monocoque structure, including the control surfaces, with a non-retractable tail-wheel undercarriage. Power is supplied by a 220-h.p. Praga Doris M.208.B engine of Czech design, which drives a 7-ft. 6-in. two-blade adjustable-pitch propeller.

The cockpits are in tandem, with a sliding one-piece canopy. RSI-6k radio, KP-18 oxygen equipment and SPU-2B intercom. are to be standard equipment.

DIMENSIONS.—Span, 31 ft. 2 in.; length, 25 ft.; height, 9 ft. 2 in.; wing area, 146.56 sq. ft.; aspect ratio, 6.63; track, 8 ft. 6 in.

WEIGHT.—Maximum loaded, 2,244 lb.

PERFORMANCE (estimated).—Maximum speed, 164 m.p.h.; cruising speed, 149 m.p.h.; ceiling, 18,368 ft.

CORRESPONDENCE

Training B.E.A. Captains

I SHOULD like to correct certain of the statements made by your correspondent "Excalibur" (THE AEROPLANE, March 14, 1958).

B.E.A. has never accepted as a pilot a man who had been rejected from the basic stage of Service flying training. There is not the slightest possibility that a person with such an unsatisfactory history would be accepted.

In reply to "Excalibur's" other complaint, it is true that B.E.A.'s policy is to recruit the younger pilots. This policy is based on the fact that newly recruited pilots must take their place at the bottom of the seniority list, and can therefore expect to remain in the right-hand seat for as much as ten years before becoming eligible for Captaincy. It must also be remembered that the average age for B.E.A. Captains is now in the late thirties; it is obviously necessary and desirable that we should produce a graduated age-range and succession by recruiting young men in their early twenties.

"Excalibur" need have no fears; every B.E.A. aircraft on service has "experience on the bridge." Our present recruitment policy is designed to keep things that way by providing the best possible airline experience for the B.E.A. Captains of the future.

London Airport. W. J. JOHNSON.
(Captain, Flight Manager Training, B.E.A.)

Modernizing the Autogiro

I AM surprised that nobody has commented on the proposal made by General Parham (THE AEROPLANE, February 7) that a modernized version of the C.19 and C.30 Autogiros should be put on the market. So much has been learnt about rotors in the interim that considerable improvement should be possible.

Also it might be possible to simplify the revving-up of the rotor system by reverting to the old scheme of using the elevator to deflect the slipstream through the rotor in order to start it spinning. In addition, just before take-off, small solid-fuel rockets at the wing-tips could be fired to bring the rotor speed up to the necessary figure so that only a minimum forward run would be needed. By some such means the expensive and complicated mechanical drive from the engine system to the rotor-head could be dispensed with.

Richmond, Surrey. "SOUTH AFRICAN."

Whence the Jet-engined Tail?

THE recent trend in mounting jet engines at the tail end of the fuselage, as exemplified by the V.C.10, the D.H.121 and the Bristol 200, is generally supposed to have stemmed from the Caravelle.

Many will remember the Miles Libellula tandem-wing monoplane which first flew in 1943. This was a scale model of a projected high-altitude unarmed bomber to Specification B.11/41 to be powered initially by two Merlin engines and later by three Power Jets W.2/700 jet engines mounted abreast at the tail end of the fuselage.

In 1944 the triple-jet version was submitted to the Postmaster-General as a possible high-speed mailplane. Although he was enthusiastic about the idea, he was unable to get the machine built. Nevertheless, the Libellula may have been the prototype of the "jets in the tail" idea, the advantages of which were quickly recognized by THE AEROPLANE which on November 10, 1944, said, "Obviously the Libellula as a type is a Heaven-sent gift for jet propulsion." A delta Libellula may yet prove to be the best configuration for flight at Mach 3.

Farnborough, Hants. D. L. BROWN.

A Help or a Hindrance?

IT was interesting to read Lord Douglas' comments (March 7, p. 313) on the reasons which led B.E.A. to order Comets and, later, D.H.121s—but difficult to find in these comments entirely satisfactory reasoning to justify the decision to change horses in mid-stream.

Lord Douglas is quoted as writing that "nobody now doubts that this next decade will be the beginning of the 'jet era'," adding that Britain must be in a position to sell first-line transport aircraft during the next decade.

Both statements are perfectly reasonable when applied to medium- and long-haul operations and aircraft—and possibly also, from the point of view of one section of the British manufacturing industry, when applied to short-haul aircraft. But they do not, in themselves, provide any very cogent reason for B.E.A.'s decision.

This decision, while undoubtedly giving the U.K. a flying start in the specialist short-haul turbojet business, must, at the same time, have exactly the opposite effect on the turboprop business into which Britain has actually entered with some very real success.

No doubt competition, or the fear of competition, has forced this decision. If so, that reason can be accepted, but it seems to me that Lord Douglas is begging the question when he justifies the purchases as a means of helping the British aircraft industry. The decision helps and hinders at the same time—so the result is negative.

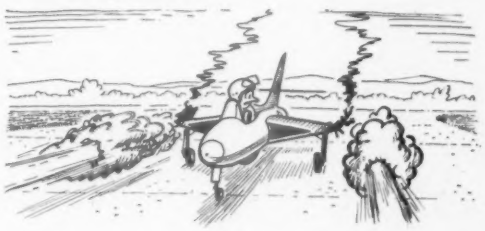
London, S.W.3. J.B.S.

Groundabout

New Design Approach. May this column get slightly technical for a moment? How will the new tail-jet airliners be longitudinally balanced when there are no passengers whose weight is, one supposes, normally counted on to keep the nose down? Or are the makers so confident of these airliners' passenger appeal that they refuse to envisage an empty seat? Oh, well, ask a silly question . . .

*

In the Beginning. . . . A friend from R.A.F. Manby tells me they have among some aviation relics a 45-year-old poster advertising an air-race meeting and assuring prospective spectators that there would be "No Waiting Between Crashes." In those golden days the pilot used to step out of the heap and help sweep it up. More recently I have known air displays where there have been waits, even between the other waits, but mishaps are almost unknown, thank heavens, though I'm sure it's only a matter of time before those nearest-inch Hunter boys get involved in something like this:—



*

The Constant Cat. The above reference to the old aeroplanes' performances reminds me of what an R.A.F. Catalina flying-boat pilot said of that fine old war-horse's capabilities: "She does everything at 70 knots—climb, cruise and crash."

*

Catalytic. Then there's the story of a Catalina's famous victory over a U-boat whose periscope was just showing above the Atlantic. The pilot alighted, taxied the "Cat" alongside while a crew-member slapped some sea-green paint over the periscope's lens, and then took off again. The U-boat captain, figuring he was submerging, shouted orders to surface, and still seeing green, went on howling, "Achtung! Climb!" until the "Cat" shot it down at 3,000 ft.

*

Hatfield in Washington. One of the American jet liners is already out in front, to judge from the label on a package received from the Boeing Transport Division. Their plant at Renton, Washington, is, according to legend thereon, "The Jet Transport Capital of the World." However that may be, I *can* tell them that any organization calling itself the Boeing *Airplane* Company is lucky to get a mention in a magazine with a name like ours.

by Lorenzo

NOTES AND EVENTS

BRITISH EXPORT—1.—The first of two Eland turboprops being loaded into a P.A.A. Douglas DC-6 for transport to Santa Monica, Calif., where they are to replace the piston engines in a Convair 440 being converted by PacAero Engineering.

BRUSSELS EXHIBIT.—The nose section of a Fairey F.D.2 has been shipped to Belgium, where it will be shown in the British Industries Pavilion at the forthcoming Universal and International Exhibition at Brussels.

DUNLOP DEVELOPMENT.—A new cushioning material, described as a polyether foam and claimed to be the most rubber-like synthetic foam so far developed, is announced by Dunlop. It is expected to have great possibilities in the aircraft industry because weight for weight it will support a greater load than latex foam.

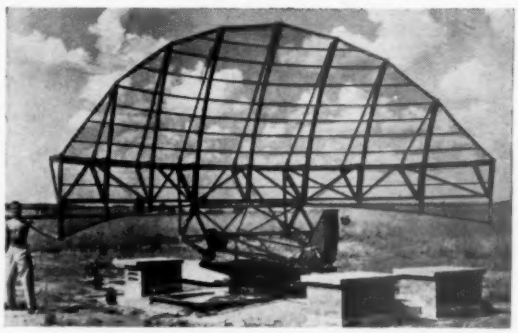
WILLIAMSON PROGRESS. — The expansion programme of the Williamson Manufacturing Co., Ltd., is nearing completion and its new buildings are almost ready. Despite defence cuts the company has much work to do and production during the year is higher than in the previous one.

AT EARLS COURT.—Among the companies which will have stands at the Factory Equipment Exhibition, to be held from April 14-19, will be Simmonds Aerocessories, who will show a range of fasteners, nuts and tools; the Minnesota Mining and Manufacturing Co., with electrical tapes and non-slip surfacing; and Access Equipment with overhead maintenance towers and safety steps on view.

NAVAID ORDERS. — The latest Rebecca equipment, which includes facilities for the use of BABS Mk. 4, manufactured by Murphy Radio, Ltd., has been ordered by the Indian Air Force and B.O.A.C. The I.A.F. is to equip its Hawker Hunter 56s with Rebecca 8 and to use the equipment as the standard navigational aid for fighter aircraft, and B.O.A.C. is fitting Rebecca 8B, a secondary radar aid, in its D.H. Comet 4s. The South African Department of Transport has recently ordered a number of Eureka 7 beacons for use with the Rebecca 8 in S.A.A. Viscounts.

SOLARTRON - ERICSSON. — The Solartron Electronic Group, Ltd., of Thames Ditton, is to be responsible for sales of equipment produced by Ericsson Telephones, Ltd., of New Basford, Nottingham. Solartron servo-testing and tape data-recording equipment is used in the aircraft industry. Ericsson produce electronic instruments and components.

OIL EXPLORATION. — Fison-Airwork, Ltd., has hired a Westland Whirlwind to the Pakistan Shell Oil Co., Ltd., to transport men and equipment in connection with oil exploration in West Pakistan. Fison-Airwork now operates a fleet of five Whirlwinds and 15 Hillers.



BRITISH EXPORT—2.—The aerial head of the Marconi type S232 radar recently installed at Jan Smuts Airport, Johannesburg. Since this, the World's first crystal-controlled 50-cm. radar, was introduced three years ago Marconi's have received orders worth more than £1 million for it.

Aviation Calendar

April 5.—British Interplanetary Society lecture, "Problems of Handling Large Missiles," by F. R. F. Taylor, B.A., A.M.I.Mech.E., A.M.I.Prod.E., in the Tudor Room, Caxton Hall, **London,** S.W.1, at 18.00 hrs.

April 10. — R.Ae.S. Main Lecture, "Guided Weapons," by R. Cockburn, C.B., O.B.E., Ph.D., F.R.Ae.S., at the Inst. of Mech. Engineers, Birdcage Walk, **London,** S.W.1, at 18.00 hrs.

April 11.—Helic. Assn. of G.B. lecture, "Powered Lift Systems," by C. H. Zimmerman, M.S., F.I.A.S. (NACA, U.S.A.), in the R.Ae.S. library, 4 Hamilton Place, **London,** W.1, at 18.00 hrs.

April 11.—North London Aero Club ball, at the Cranbourne Rooms, **Hatfield,** Herts, from 20.00 hrs.

April 15. — R.Ae.S. Section Lecture, "The Problems of Vertical Take-off," by Dr. C. T. Hewson, in the library, 4 Hamilton Place, **London,** W.1, at 19.00 hrs.

April 15.—Brit. Inst. of Radio Engineers lecture, "Factors in the Design of Airborne Doppler Navigation Equipment," by E. G. Walker, at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C.1, at 18.30 hrs.

April 16. — R.Ae.S. Preston Branch A.G.M. and film show, at the R.A.F. Association, **Preston,** at 19.30 hrs.

April 16. — R.Ae.S. London Airport Branch lecture, "Titanium," by H. W. Shaw, Ph.D., B.Sc., A.M.I.Mech.E., A.M.I.E.E. (I.C.I.), at **London Airport,** at 18.00 hrs.

April 21.—Women's Engineering Society London Branch lecture, "Philosophy of Guided Missile Design," by Wg. Cdr. P. M. Chettle, B.Sc.(Eng.), at the Central Electricity Authority headquarters, Winsley Street, **London,** W.1, at 18.45 hrs.

April 23. — R.Ae.S. Leicester Branch A.G.M. and film show in the lecture theatre, **Loughborough College,** at 18.45 hrs.

April 25.—Inst. of Navigation meeting, "The Use of Simulators for Training Navigators to Use Radar Equipment"—a description with contributions from the R.N., the R.A.F. and M.T.C.A., at the R.G.S., 1 Kensington Gore, **London,** S.W.7, at 17.15 hrs.

April 30.—R.Ae.S. Weybridge Branch A.G.M. at the Apprentice Training School, Vickers-Armstrongs (Aircraft), Ltd., **Weybridge,** at 18.00 hrs.

Company Notices

NEW COMPANY

Field Aircraft Ancillaries, Ltd. (600,618).—Private co. Reg. March 17. Cap. £100 in £1 shs. Objects: To carry on the business of aeronautical, marine, mechanical, constructional consulting and precision engineers and contractors, etc. Directors: John L. Smith; Ernest H. Baker, Doushka, 17 The High Lawns, Edgehill Rd., Purley, Surrey; John D. Capstick and Eric G. Monk. Subscriber: Frank W. Dymond, 30 The Ridgeway, Kenton, Harrow, company secretary. Reg. off.: 72 Wigmore St., London, W.1.

RECEIVERSHIP RELEASE

Adie Aviation, Ltd. (441,511), 55 Welbeck St., London, W.1.—Victor D. Boorman, of 84 Heath Rd., Twickenham, Middx, ceased to act as Receiver on January 31, 1958.

Personal Notices

BIRTHS

Anderson.—On March 20, at Lincoln, to Joyce, wife of Flt. Lt. R. Anderson—a daughter.

Bowtle.—On March 15, at Norwich, to Joyce (*née* Foster), wife of G. H. G. Bowtle, R.A.F.—twin daughters.

Covell.—On March 21, to Jennifer (*née* Platt), wife of Plt. Off. P. L. Covell, R.A.F.—a daughter.

Elkins.—On March 21, in Singapore, to Ethne (*née* Palmer), wife of Flt. Lt. J. Elkins, R.A.F., Seletar—a son.

Jenkins.—On March 20, at R.A.F. Hospital, Halton, to Dorothy (*née* Phillips), wife of W. Jenkins—a daughter.

Jenkins.—On March 20, at Halton, to Evelyn (*née* Power), wife of Sqn. Ldr. H. H. Jenkins—a son.

Lawley.—On March 19, at Aldershot, to Margery (*née* Macpherson), wife of Sqn. Ldr. B. J. Lawley—a daughter.

Miller.—On March 22, at Bradford-on-Avon, to Sylvia, wife of Flt. Lt. A. G. Miller—a son.

Pelly.—On March 15, at Enfield, to Cass, wife of Sqn. Ldr. A. Pelly—a daughter.

MARRIAGE

Sharman—Stone.—On March 21, at St. Giles' Church, Cheddington, Bucks, Sqn. Ldr. A. J. Sharman, A.F.C., to H. D. Stone.

New Patents

APPLICATIONS ACCEPTED

794,867.—Lear, Inc.—"Instrument aid for aircraft radio navigation."—April 11, 1956 (April 11, 1955).

795,048.—Soc. Nationale d'Etude et de Construction de Moteurs d'Aviation.—"Vertical take-off and landing aircraft."—Nov. 22, 1956 (Nov. 22, 1955).

795,050.—Rolls-Royce, Ltd.—"Aircraft and aircraft installations."—Sept. 23, 1953 (Sept. 23, 1952).

Applications open to public inspection on May 14, 1958; opposition period expires on August 14, 1958.